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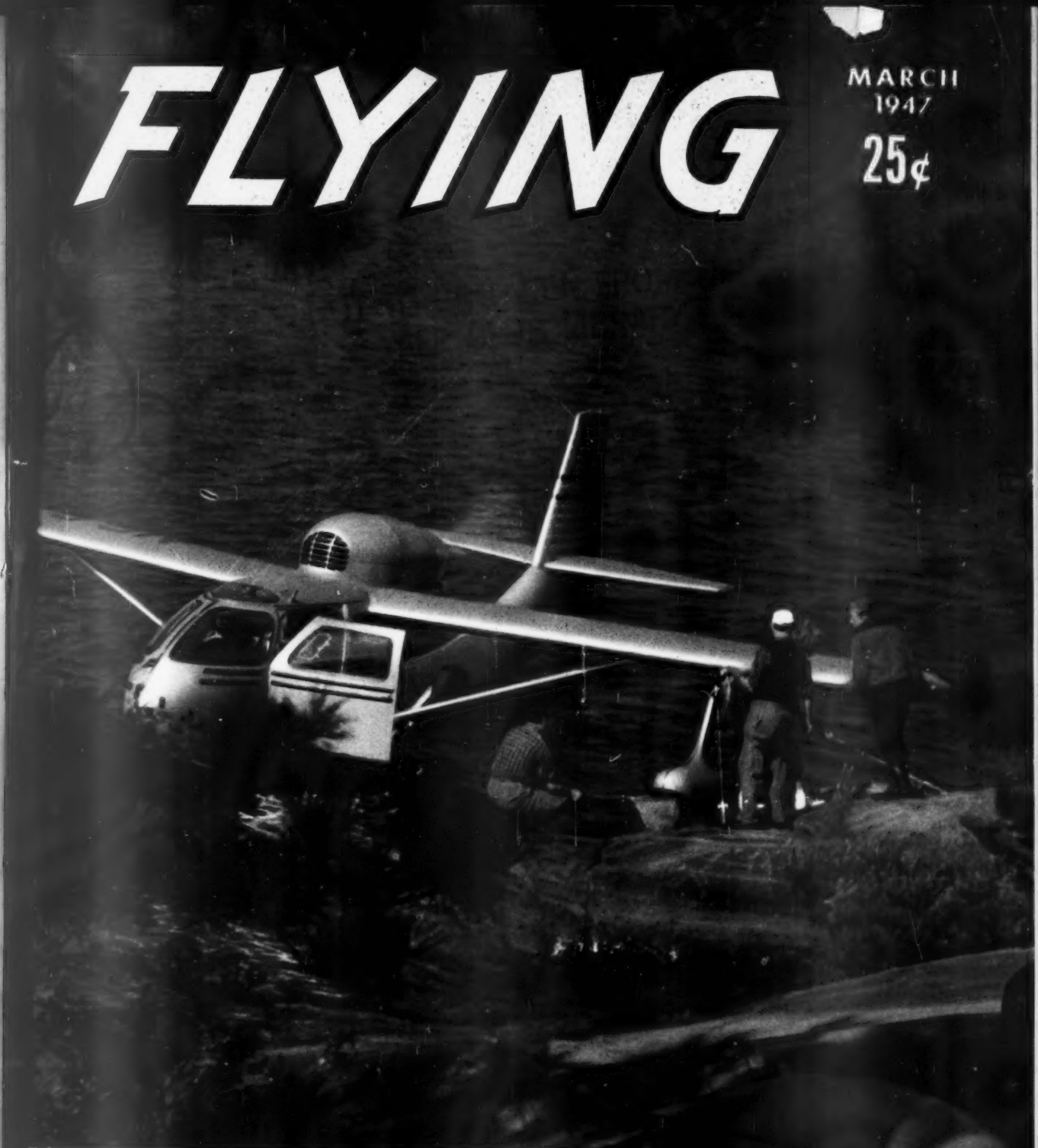

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Fliers' First Choice

POWER BY
Red Seal
Engines
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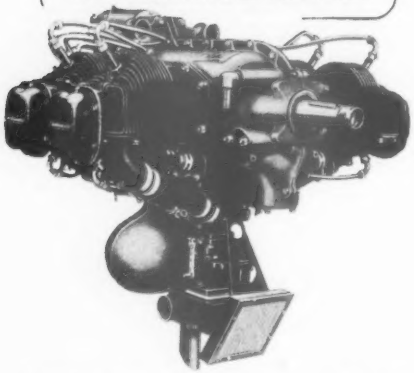

C85. This 4-cylinder 85 h.p. engine is a post war addition to the Continental line. It delivers its full rated horsepower at moderate engine speed, so that maximum propeller efficiency is attained. Low r.p.m. in relation to power is a characteristic of all Continental aircraft engines.

Continental Red Seal Engines *power more personal planes than all other engines combined*

From the standpoint of volume, as well as from that of quality, Continental Motors leadership in the personal plane engine field stands today at an all-time high. Continental Red Seal engines power more personal aircraft than all other engines combined. The overwhelming preference reflected in such leadership is the best of all possible reasons for choosing a plane with Red Seal power.

CONTINENTAL PARTS and SERVICE
Near As Your Nearest Airport

Fly where you please, you'll find Continental parts and service there ahead of you. There are now nearly 1,000 parts and service depots at airports all over North America.

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MUSKEGON, MICHIGAN

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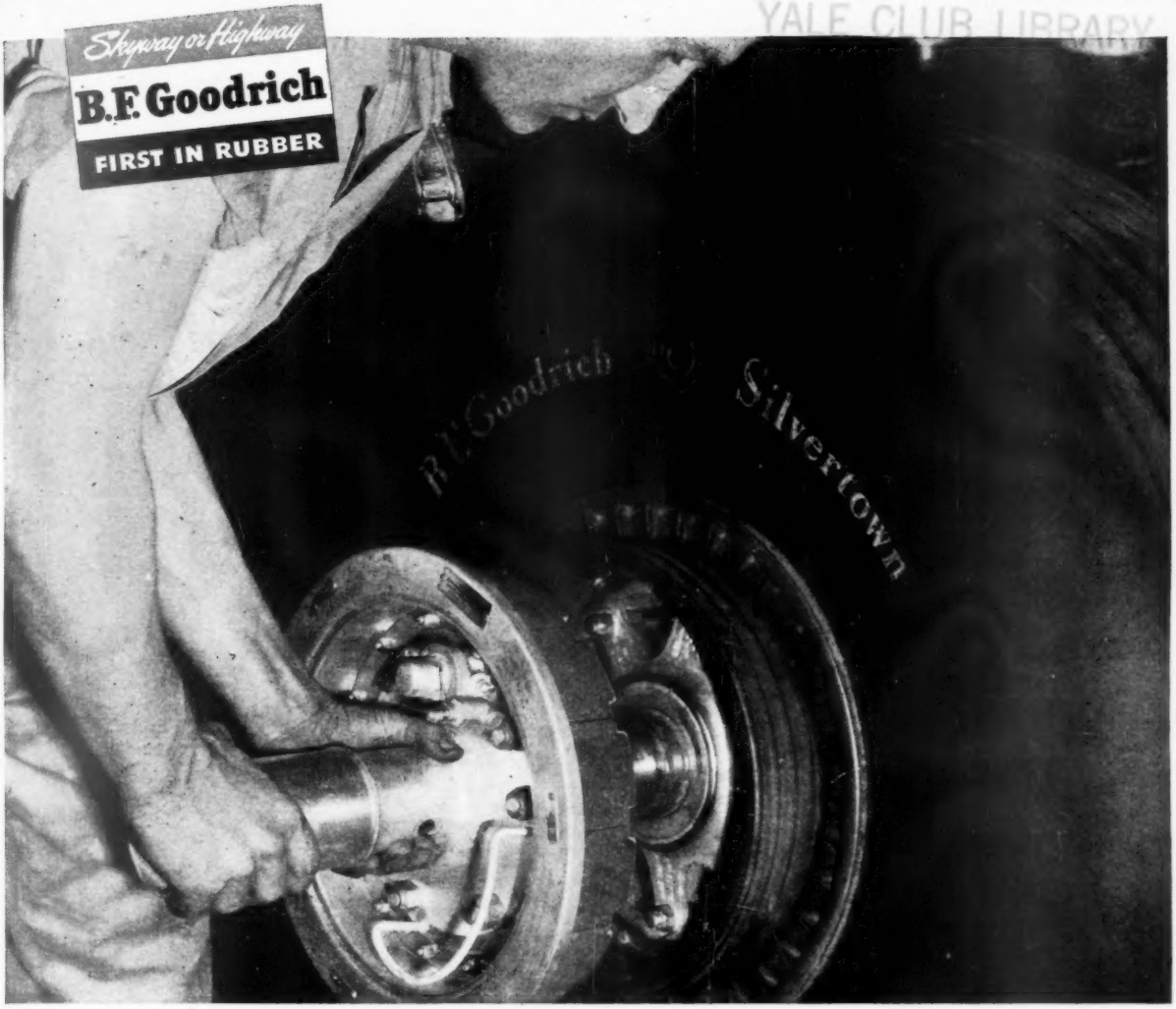

New B. F. Goodrich assembly gives maintenance men a break

THE Braniff International Airways mechanic shown in the picture is completing one of the easiest of his maintenance duties. He's just overhauled a B. F. Goodrich Expander Tube brake. The mechanic likes the brake because he doesn't have to tear the whole thing down to replace the brake lining, and he doesn't need a lot of special tools to do the work.

The engineers at Braniff like the extremely low maintenance cost. There are two reasons why that cost figure is so low. The brake needs *less* maintenance when it is in the shop, and it is in the shop less often than other type brakes. One reason for this is that a hydraulically operated tube forces brake blocks against the brake drum *evenly* all the way around. This results in powerful action with minimum pressure and minimum wear.

The designer likes the simplicity of design for another reason. The B. F. Goodrich Expander Tube brake can be made lighter for a given amount of kinetic energy than any other type brake. From the Lockheed Constitution to the Piper Cub, this advantage has proved itself on every type of modern aircraft.

B. F. Goodrich Silvertown tires, wheels and brakes are now sold as a complete assembly—an important new service to airlines and to manufacturers. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

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THE COVER: Republic Seabee on Lake Commandant, Canada. Photo by Roy Battersby.

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MARCH • 1947

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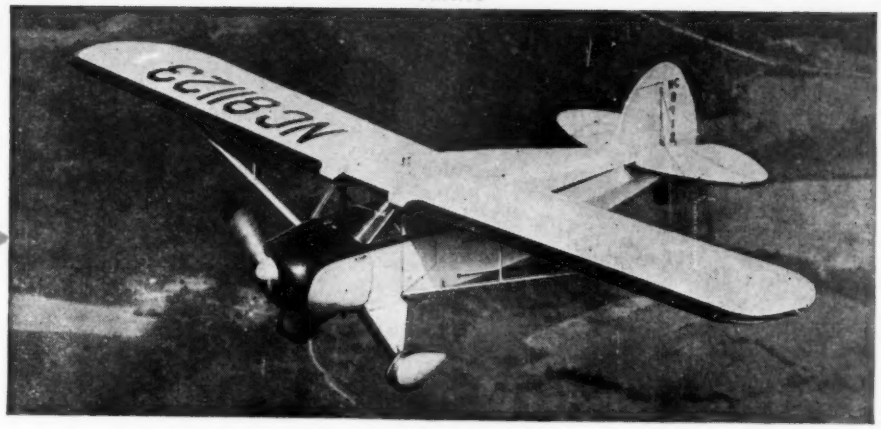

THERE'S FUN IN YOUR FUTURE . . . WITH A FUNK F2B!

And, brother, you'll love it! Business trips will be a pleasure . . . and pleasure jaunts even better!

You'll be meeting new adventures, new thrills. And we hope too that you'll be meeting *us!* Yes, at our "66" pumps on big and small air fields all over the great Middle-West!

We've got some good things for you at those "66" signs . . . our best aviation fuels and lubricants.

Guess we had you in mind when we produced and distributed supplies of fine quality engine lubricants . . . and UNleaded 80-octane gasoline to all our airport stations.

How about keeping *us* on your mind now? We'll be waiting for you to taxi over. The Aviation Department, Phillips Petroleum Company, Bartlesville, Oklahoma.

Phillips 66

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SOLD BY LEADING DEALERS Everywhere

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LETTERS

HOW DID THEY DO IT?

The story "Two Gals and a Plane (November issue) convinces me that women are better cooks than accountants. One hundred dollars for gas and oil for 20,000 miles is very cheap transportation—too cheap. Granting the Aeronca a cruising speed of 90 m.p.h. (I'm giving her plenty of tail wind) it would cost approximately 45c per hour for gas and oil.

The "gals" must have had some new type of engine that burns only 1½ gallons per hour at cruising r.p.m.

I suggest that Miss Nichols recheck all her gas and oil receipts before criticizing the "solemn male experts."

ERNEST KARL

Schenectady, N. Y.

● Several letters have questioned this cost estimate on gas and oil. The gals still swear they spent only $100.—ED.

ANOTHER DOWNTOWN AIRSTRIP

In the article "Shoppers' Air Strip" (December issue) this statement appears: "However, the Wisconsin metropolis (Milwaukee) is the only city in the United States offering such service."

In St. Petersburg we have a large and active municipal airport, completely equipped for land and seaplanes. And it is within three minutes walking distance of our central downtown business and shopping section.

The aerial photograph (below) shows how close the Albert Whitted Airport is to the business section. It is a Class 2 airport with hard surfaced runways. There are three steel hangars, an administration building and field marker lights. Since the photograph was taken, seaplane activities are being carried out on the lagoon at the left of the airport, with the establishment of a private operators' base there. Besides six private operators, there are about 600 GI flying students and the customary run of civilians. Also, it is a base for commercial cargo carriers and the Coast Guard.

DR. CHARLES S. COAKER

Pilot's Cross Country Club of St. Pete.

St. Petersburg, Fla.

TOO MANY LICENSES

I heartily agree with the article by J. B. Hartranft, Jr. ("License Fever", January issue) in which he mentions the necessary state licenses that must be taken out because a pilot happens to stay awhile for pleasure or business.

We pay a state license for automobiles and can cross state borders at will, except for a few states that require border inspection.

I now own an *Ercoupe* and am in the market for a four-passenger plane and perhaps in time a larger one to use for pleasure and business. But if the states keep putting restrictions on us, I may as well forget about the whole thing and do my traveling by car or train.

Why don't the aircraft manufacturers get together and put on the pressure?

WM. H. BERSSENBRUGGE

Kenosha, Wis.

POWER-ON LANDING TECHNIQUE

In the article "How to Fly in Mountains" (November issue) the following caption is dangerously wrong: "Power-on landing made by this Taylorcraft pilot is proper mountain technique which minimizes stall danger at high altitudes."

Power-on landing technique is not

(*Continued on page* 100)

Albert Whitted Airport is only five blocks from St. Petersburg's business and shopping center. Seaplane activities are carried out on lagoon at left of airport.

When an Aeromatic* Propeller Gives You More Get-Up-and-Go!

TAKE-OFF: With engine at full throttle, Aeromatic Propeller assumes low pitch automatically . . . gets plane off ground quickly, allows use of full take-off power.

CLIMBING: Aeromatic responds to natural forces . . . increases pitch automatically as air speed increases . . . gets plane to cruising level fast . . . on minimum fuel.

CRUISING: Aeromatic automatically maintains the most advantageous pitch . . . for top cruising performance on minimum fuel at any level up to critical altitude.

LANDING: Aeromatic adjusts its pitch automatically for a long flat glide . . . moves to low pitch instantly for a quick pickup if the pilot overshoots the field.

For tops in flying enjoyment, there's nothing like an Aeromatic on your private plane!

IT'S COMPLETELY AUTOMATIC! The Aeromatic Propeller is the *only* completely self-acting and self-contained propeller . . . varies its own pitch automatically for peak performance all the way. There are no extra controls to fuss with . . . no extra instruments to watch.

PUTS MORE PEP IN YOUR PLANE! One-fourth shorter take-off run! One-third higher rate of climb! Greater cruising range and speed! All with less fuel consumption, less engine wear! That's what you get from Aeromatic—"the propeller with a brain."

WRITE FOR INFORMATION! If you own a new plane or plan to buy one, enjoy the extra advantages of an Aeromatic Propeller. Write to your aircraft manufacturer or distributor and see if you can have an Aeromatic on your plane. Or drop us a line for free Aeromatic booklet. Koppers Co., Inc., Aeromatic Propeller Dept., 233 Scott St., Baltimore 3, Md.

Custom-Tailored for the Planes they Fly

They are available now for most new private planes and are being installed on other makes and models.

The Propeller with a Brain for Your Private Plane

Aeromatic

Air Controlled Automatic Propeller

Licensed under patents of Everel Propeller Corp.

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KOPPERS

BUT HIS INCOME GOES ON!

It was really a bad accident. It cost this pilot his job—but it didn't cost him anything for the hospital, nurse, or the doctor. And in addition to having all these bills paid, this pilot is receiving $200 every month—and he will continue to receive that sum every month for *five* years.

He carried his personal accident insurance with the Great American Reserve and he bought all this protection for a premium of only $35 a year. Check your own Personal Aviation policy—does it give you this complete protection? Does it pay you a monthly disability for *five* years? If not, we will be glad to tell you about this greater protection. Just mail the coupon.

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Please send me complete information about your Personal Aviation Accident policy. I understand there is no obligation.

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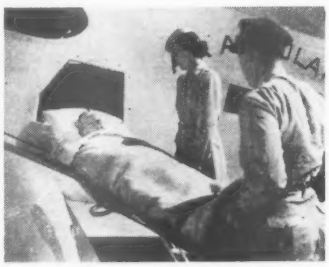
HAVE YOU HEARD?

. . . Lightplanes will compete for prizes totaling $25,000 at the Cleveland National Air Races this year. The prizes are to be offered by Goodyear Tire & Rubber Co. Elmination trials will reduce the number of initial entrants from 24 to 12, semi-finals will eliminate six more and the finals will compete on Labor Day over 15 laps of a five-mile course. Pilots must have a minimum of 200 solo hours to qualify, plus 10 certified hours in the plane they race for every 100 hours short of 500 solo hours.

. . . Air Ambulance, Inc., the first CAA-licensed service of its kind in the country, has been started by two ex-AAF pilots in Durham, N. C., to provide fast air transportation for patients to any part of the United States. Cessna



twin-engine transports have been specially re-outfitted as air ambulances. A registered nurse accompanies each patient. Flying altitudes are prescribed by physician or nurse. (See cut.)

. . . "It's dangerous to drive a car," says Wisconsin's Dr. B. I. Pippin who has been flying the 50 miles from Richland Center to Reedsburg Municipal Hospital since 1922. He estimates that air travel has saved him almost six months' time in the past 24 years. He has been flying his own plane to medical conventions since 1926. Dr. Pippin's prescription for land-bound worriers: "Nothing like altitude for tired nerves."

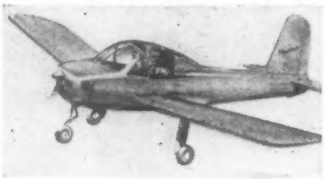
. . . "Sky Wings" is a new airline ticket delivery service in New York. Manhattan residents phone for reservations and tickets are delivered for a fee of $1. For persons holding air travel cards, the messenger will check signatures and carry back ticket orders.

. . . Every fifth employee in the aviation industry probably is a veteran, according to the Aircraft Industries Association's recent survey of 14 major aircraft companies. Of the 44,000 veterans employed, more than 1,400 are disabled or physically handicapped. And there are still many job openings for veterans, the survey indicates. Nine of the 14 companies are in need of engineers, machinists, tool designers, engine mechanics, fabrication specialists, assemblers and sheet metal workers.

. . . An entertainment act to sell aviation to skeptical kiwis is being given by Lieut. Col. Ken A. Willard, of Parks Sales and Service, East St. Louis. The program, available to luncheon clubs, civic groups, schools, churches, etc., includes a 10-minute speech about private flying today, a 10-minute colored motion picture showing differences between service flight training and private flying requirements and illustrating the simple maneuvers necessary for a private pilot's license, and a third period in which flying model planes demonstrate that personal planes actually fly themselves and that their pilots merely position them for maneuvers.

. . . Under-wing refueling that cuts ground-handling time on transports 50 per cent was recently demonstrated on a Martin 202, the first plane equipped for under-wing refueling. The plane was serviced by a specially-designed Shell aviation truck. Other advantages claimed for the new system are greater safety, convenience and economy.

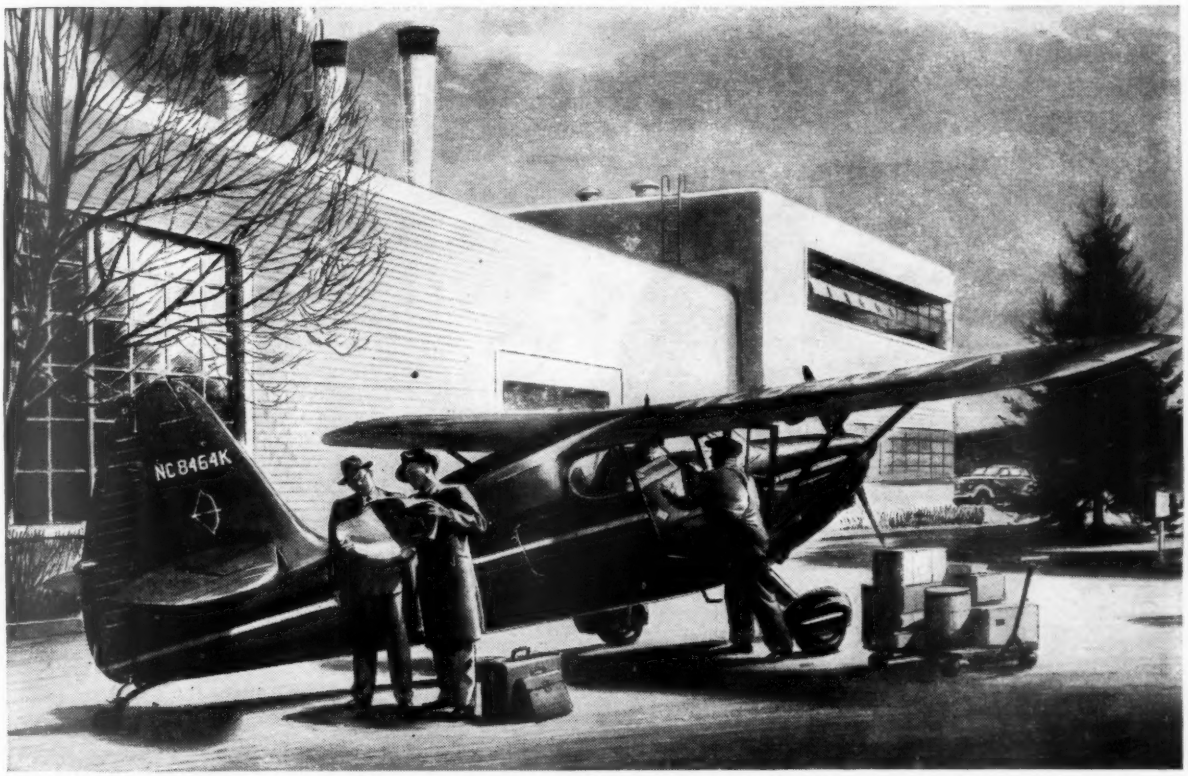
. . . Another entrant in the personal lightplane market is the Thorp Aircraft Co. with its *Sky-Skooter* (see cut). John W. Thorp, president, developed the *Little Dipper* for Lockheed and was one of the designers of the *Truculent Turtle*. Designed primarily for low production cost, the *Sky-Skooter* is all metal and low wing with a tricycle landing gear. It weighs only 560 pounds empty



and 1,050 fully loaded. It can operate from small fields and landing strips because of its high take-off performance.

. . . Visiting pilots and passengers get "The Compass" when they land at Love Field, Dallas, Tex. A pocket-size booklet prepared by Southwest Airmotive Co., it contains a diagram of Love Field, a chart of local radio facilities, field regulations and telephone numbers for taxis, hotels and airlines. It also tells the Dallas visitors where to go for good food and entertainment. END

Presenting America's first personal "cargo" plane



Flying businessman prepares to take off from company runway in his Stinson Flying Station Wagon to cover his 3-state sales territory.

...the new STINSON "Flying Station Wagon"!

NOW, FOR '47, Stinson presents *another* outstanding *21st Anniversary* plane in addition to the luxurious 4-place Voyager.

The second thrilling new plane is the husky Stinson Flying Station Wagon—America's first "workhorse" personal plane—a "fly-anywhere" plane with all the comfort features, dependability, and inherent stability of the famed Voyager.

Like the Voyager, this new Stinson is . . .

a proved personal plane—improved for '47!

If you're a flying businessman, you'll welcome this superb carry-all plane.

If you're a farmer or rancher, the Flying Station Wagon is just what you need for hurry-up trips to get equipment parts and other "needed-now" supplies. And on vacation, hunting, or fishing trips, there's room for all the duffle you'll want to take along. Rear seats readily replaceable to make it a four-place plane.

It carries a useful load of 1006 lbs. Cruises at 125 m.p.h. Maximum speed, 133 m.p.h. Take-off run, only 620 ft. Rate of climb, 650 f.p.m. Service ceiling, 13,000 ft. Stops in 290 ft. after landing.

Flaps for quick take-offs and slow, short landings. Built-in wing slots for safety. Inherently spin resistant. Two-way radio, with dome loudspeaker. Starter, hydraulic brakes, soundproofed cabin, and many other de luxe features.

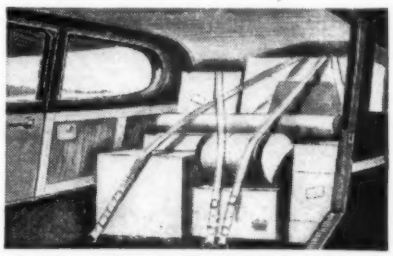
See your Stinson dealer—today.

Stinson

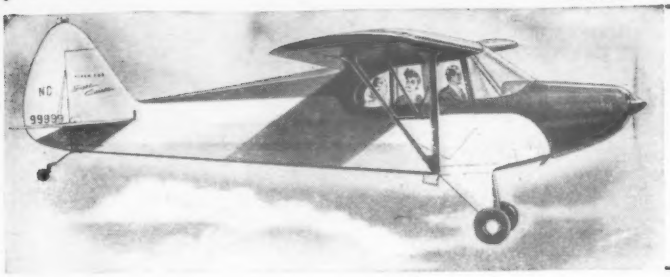
FOR 21 YEARS—AMERICA'S GREATEST NAME IN PERSONAL PLANES

Fly the new Flying Station Wagon —learn how easily you can buy it—how economical it is to own.

Write for illustrated brochure to Stinson Division, Consolidated Vultee Aircraft Corporation, Wayne, Michigan.



The Stinson Flying Station Wagon is your own personal "cargo" plane! Reinforced cargo compartment (24 cu. ft.) in 2-tone plywood paneling, equipped with tie-down straps. Cargo capacity: pilot and 600 cargo pounds, or pilot, 1 passenger, and 500 cargo pounds. The two rear seats can be replaced in 5 minutes' time.



THE PIPER CUB *Super Cruiser*

A 3-PASSENGER PLANE

WITH

100-HORSEPOWER ENGINE

AND

600-MILE CRUISING RANGE

(WITHOUT REFUELING)

Copyright 1947 Piper Aircraft Corporation

THE Piper Cub Super Cruiser is tops in the moderate price field today for value, safety and economy. See it . . . fly it . . . compare it with other personal planes!

The Super Cruiser seats *three* people. There's power to spare in its full 100-horsepower engine . . . and speed up to 115 miles per hour. You can make fast, safe trips of more than 600 miles at normal cruising speed without refueling . . . and 700 miles at economy cruising speed!

Standard equipment on the Piper Cub Super Cruiser includes many outstanding features for your safety, convenience and enjoyment . . . an auto-type electric starter and generator . . . a two-way, two-band radio that gives both airways and regular broadcast reception . . . dual controls . . . dual hydraulic brakes . . . parking brake . . . one-piece Plexiglas windshield . . . engine muffler . . . cabin heater . . . carburetor heater . . . steerable, full-swivel tail wheel . . . position lights.

Enjoy a free flight demonstration at your Piper Cub Dealer's airport now. Ask him for the full-color Piper Cub literature and the popular books . . . *How to Fly a Piper Cub* and *What Your Town Needs for the Coming Air Age*. Remember —only Piper makes the Cub, that good, safe plane. Piper Aircraft Corporation, Lock Haven, Pennsylvania, U.S.A. . . . In Canada: Cub Aircraft Corporation, Ltd., Hamilton.

LOOK TO THE LEADER FOR GOOD SAFE PLANES YOU CAN AFFORD TO BUY AND FLY

PIPER

Flightweight

BENDIX RADIO

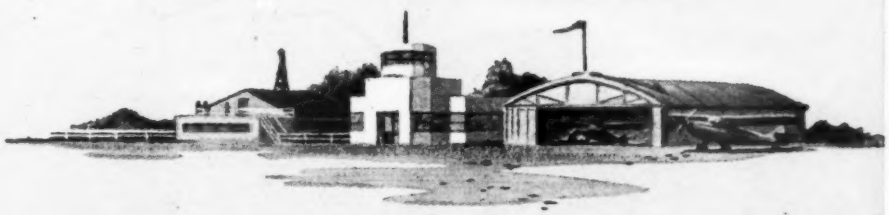
Here it is... ACTUAL SIZE!

The Bendix High-Performance Dry Battery Receiver for Your Personal Plane

Now Bendix Radio brings you the perfect low-cost answer to radio reception in smaller personal planes which are not equipped with storage battery. Bendix PAR 3-A can be used for airport traffic control, cross-country range navigation and weather reports—all in a package only 3 11/16" square weighing 1 pound 9 ounces! Can be mounted in instrument panel or attached to its own battery case with a twist of tape to make a compact and convenient portable unit!

LOOK FOR THE SIGN OF THE GREATEST NAME IN AIRCRAFT RADIO—

AUTHORIZED Flightweight BENDIX RADIO PRODUCT OF BENDIX AVIATION CORPORATION SERVICE DEALER



BENDIX RADIO DIVISION OF
BALTIMORE 4, MARYLAND
WEST COAST BRANCH—1239 AIR WAY, GLENDALE 1, CALIFORNIA

Bendix AVIATION CORPORATION

"FLOATS are building up our trade"

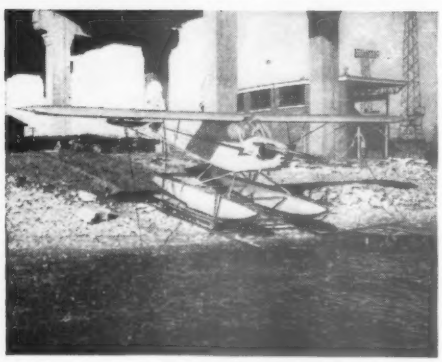
"We have yet to find one person who is not highly enthused after their first seaplane flight. And pilots new and old have only to get a taste of seaplane flying and they immediately become 'web-footed.' There is a profitable future in floats."

—Don Herrman, Manager, Seaplane Division, Elliott Flying Service
Davenport, Iowa

This Davenport floatplane base has a runway 2,560 miles long, with ample width for all take-off conditions. Mississippi Basin alone has 15,000 miles of navigable water, with thousands of good sites for new float bases.

Float flying acceptance was quick and enthusiastic when introduced in Iowa. Response was especially strong among many pilots who found a new interest in flying, due to the fun and utility natural with floatplanes.

Almost in the outfield of the local ball park, the Davenport Seaplane Base shows a main advantage of floats. Bases can be located right in the heart of a city, where they draw more crowds than suburban fields.



INLAND BASES MEAN MONEY—Where the Mississippi cuts through the heart of America's "tall corn" region, the Elliott Flying Service has introduced float flying to the Middle West. The results from a $600 installation: a steady volume of new business and a surge of renewed interest among pilots bored with landplanes.

As distributors both for Piper aircraft and also Edo floats, the Elliott firm is aiding other towns up and down the river in setting up float bases. They are building future plane and float sales. It's an example for all distributors to study. And the entry of this company into the float field demonstrates the ease with which any operator can tap this profitable flying market.

OTHER OPPORTUNITIES INLAND—There are many states where floats are still new. Since they give real fun in flying, floats are the answer to lagging interest among present landplane pilots. Facilities required for float flying are simple. Nature builds the airports; you merely have to add a dock or ramp.

WRITE TODAY . . .→ for these FREE booklets. Details of float flying, bases, construction and Edo-equipped planes. Just send a postcard or letter.

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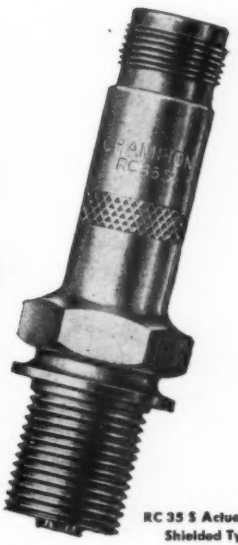
CERAMIC AIRCRAFT SPARK PLUGS



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THAN ALL OTHERS COMBINED!

Overwhelming acceptance in every engine field has made Champion "America's *Favorite* Spark Plug." This preference, of course, includes all types of aircraft—commercial, personal and military—where dependable Champion Spark Plugs are used in the vast majority of engines. Install Champions and fly with confidence! Champion Spark Plug Company, Toledo 1, Ohio.

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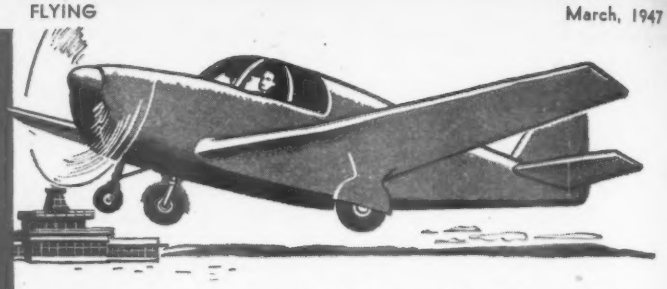
PLANE FAX



A page of service tips for private flyers and fixed-base operators

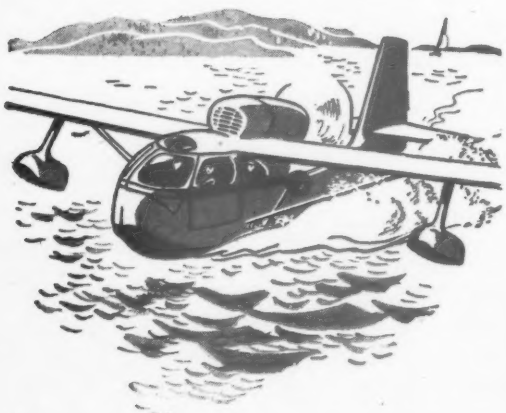
Avoid condensation in fuel for safer flying

Water in your aviation gasoline can interrupt your flying career just as effectively as a lighted match in the fuel tank. And, even after it's in the tank, condensation may still create a water hazard. Elaborate precautions are taken to see that Chevron Aviation Gasoline reaches you as pure as it was the instant it left the refinery. You can help keep it that way by filling your tanks (as airlines do) just *after landing* so that minimum air space is left for condensation during storage.

Operator extends time between overhauls

The manager of Western Aircraft Sales, Inc., of Oakland, California, W. J. Thompson, writes "After 670 hours of operation using RPM Aviation Oil we overhauled a 65 hp Continental engine in an Aeronca Champion student training plane. We found all rings free with slight deposits on the ring grooves. Valves, valve guides and stems were in excellent condition with the exception of slightly worn seats. This indicates that valve action was normal without sticking. The appearance of this engine was so outstanding we plan to extend the time between our next overhauls considerably beyond 670 hours."

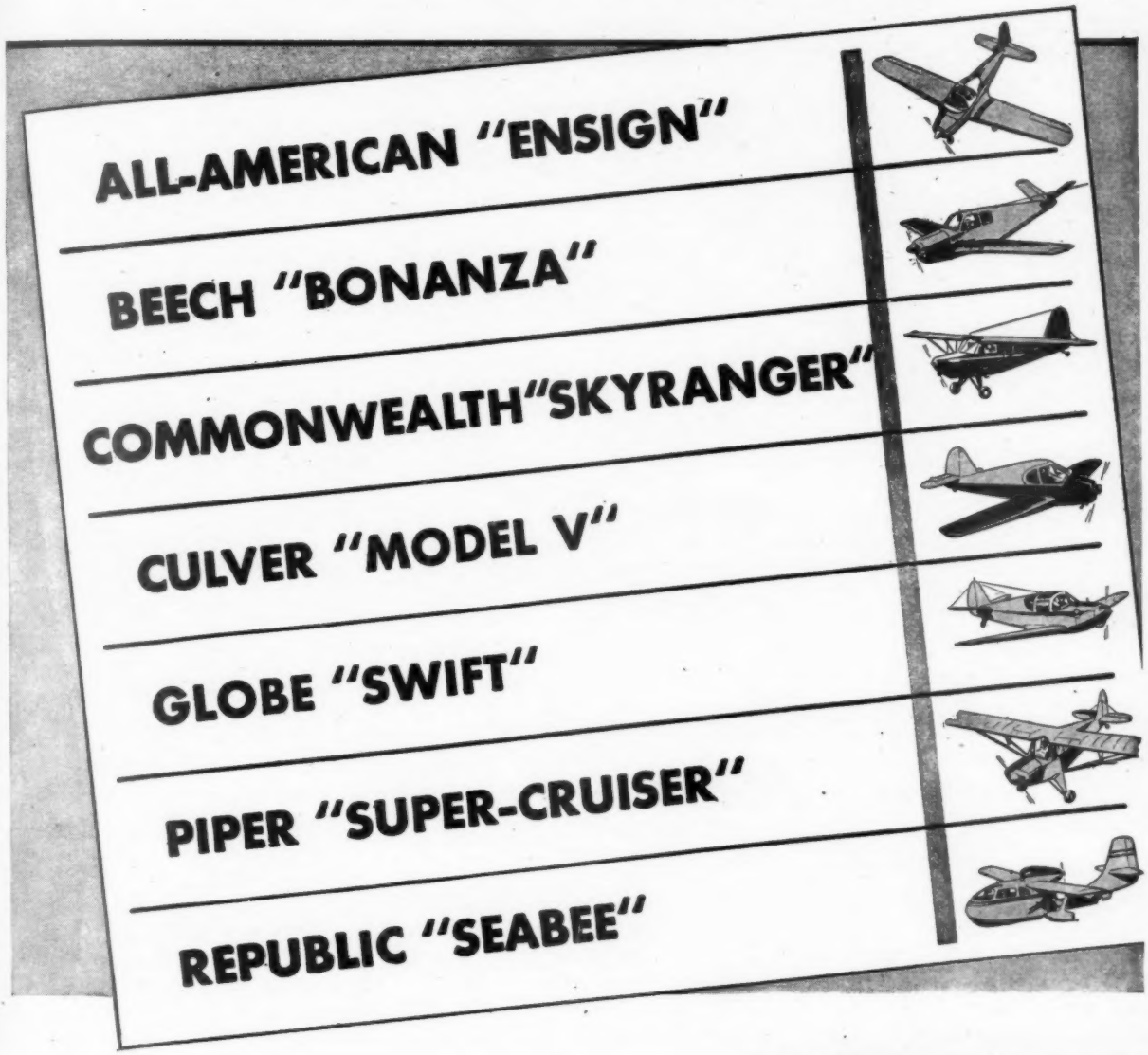
How to protect your plane parts from rust damage



Aircraft parts, particularly on seaplanes, are exposed to water spray and, unless protected, frequently rust. RPM Aviation Rustproof Oil is an excellent rust preventive for engines, fire walls and engine mounts. Spare engines going into storage can be protected, up to two months, by running them on RPM Aviation Rustproof Oil before shutdown or by spraying this oil through spark plug holes with each piston, in turn, on bottom center.

CHEVRON NATIONAL CREDIT CARDS are good at airports throughout the United States and Canada. Ask your Standard Airport Dealer in the West... or write to Standard of California, 225 Bush St., Room 1618, San Francisco 20, Cal.

They All Choose **Du Pont "LUCITE"** *...for* **Vision, Service, Safety**



YOU CAN have "Lucite" on your plane too, and gain the same advantages.

An enclosure of "Lucite" acrylic resin transmits over 90% of light rays... is shatter-resistant and extremely durable. In normal service, it lasts for the life of your plane. And one-piece construction of "Lucite" eliminates blind spots.

"Lucite" is easy to install and care for. Yet it costs even less, in medium and greater thicknesses, than other plastics sometimes used. E. I. du Pont de Nemours & Co. (Inc.), Room 253, Plastics Department, Arlington, New Jersey.

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BETTER THINGS FOR BETTER LIVING
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Unravel business travel

With a Beechcraft BONANZA

ADD up the waiting, the delay, the missed opportunities and the inconveniences confronting a business traveler in a year's time. It's a hard job at best—and an expensive one, when you count the non-productive time spent watching scenery.

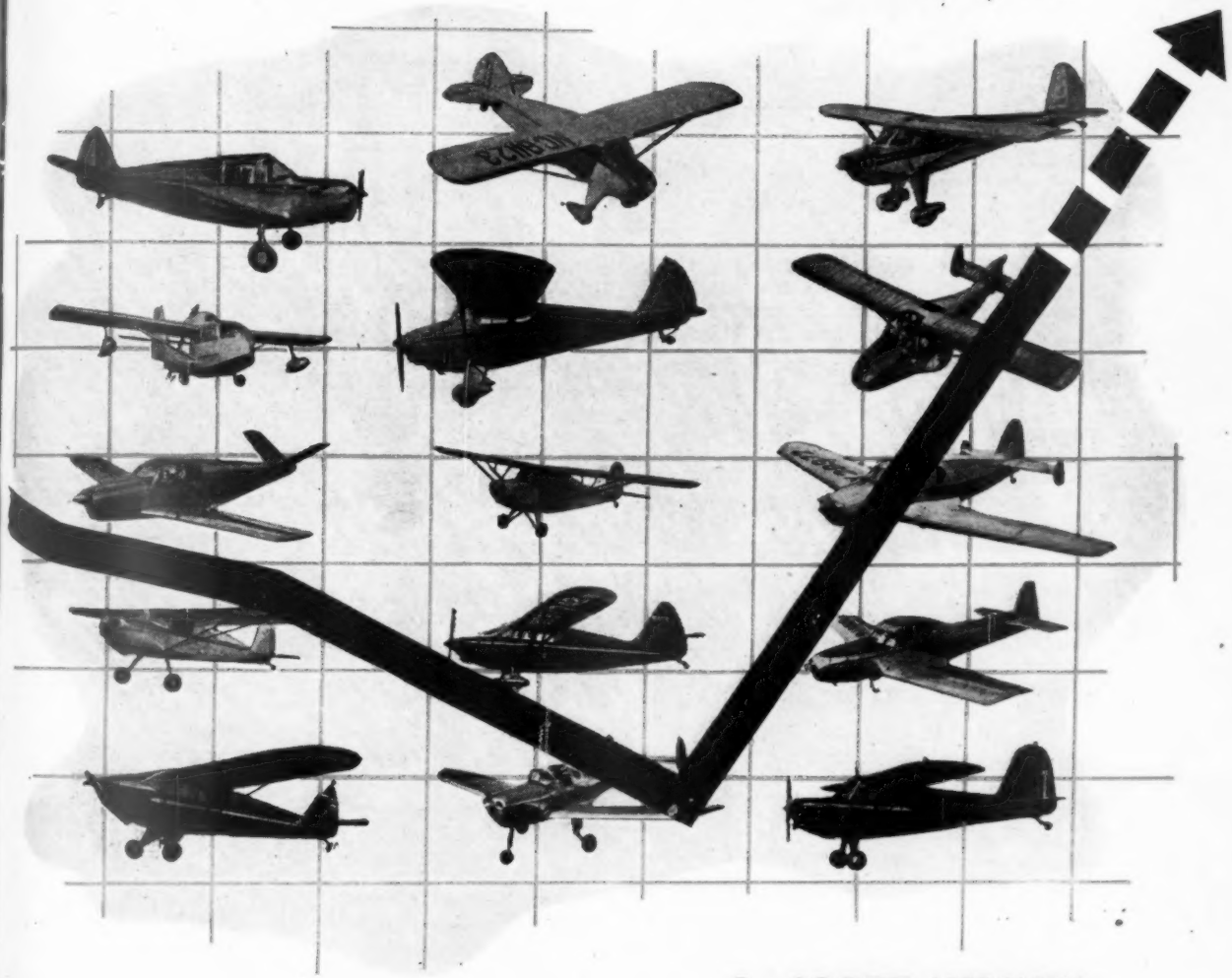
But you can soar right over travel trouble in a Beechcraft Bonanza. You have the right-of-way, you can go and come when it suits you best—at 175 mph; and you do it in luxurious, restful comfort at a cost as low as one cent per passenger mile!

The 4-place 165 hp Bonanza was designed and built for business use. Its principal achievement is revolutionary aerodynamic efficiency which gives it high speed and high payload with moderate—and economical—power. Its roomy cabin gives you limousine luxury and the quiet of an open-window car floating along at 55. It is fully equipped for around-the-clock, around-the-year flight—temperature control ventilation, two-way radio, landing lights, instruments, controllable propeller, retractable tricycle landing gear, landing flaps and a score of other refinements for your safety and comfort.

If you would unravel your business travel, let a Beechcraft distributor tell you—and show you—more about the Bonanza at $7,345 F.A.F. Wichita. Production for early 1947 is already sold. Orders for delivery will be filled in the sequence received. There's a distributor near you. Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

BEECHCRAFT
BONANZA
MODEL 35

Lightplane Bust— or Boom?



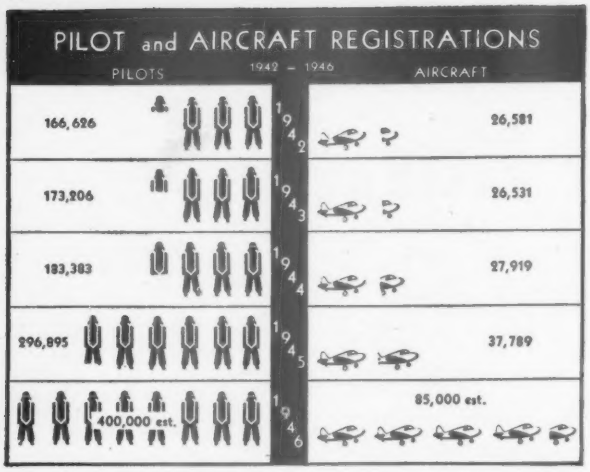
By SCOTT HERSHEY

The industry no longer is riding a gravy train. But it is not faced with ruin, as some predict.

THE PROPHETS of gloom, who view the current condition of the aviation industry with alarm and see in it an occasion for wholesale orders of crepe, simply are ignoring the facts beyond the end of their pessimistic noses.

Not that the industry is without some symptoms of *mal d'aire* but in size it now ranks about 16th in the United States. While this is a sharp contraction from its wartime position as the largest in the world, it is also a significant advance from 44th position in 1939.

This would seem to indicate, among other things, that although the industry is running a slightly abnormal temperature the patient is far from doomed. Rather, it is basically sound.



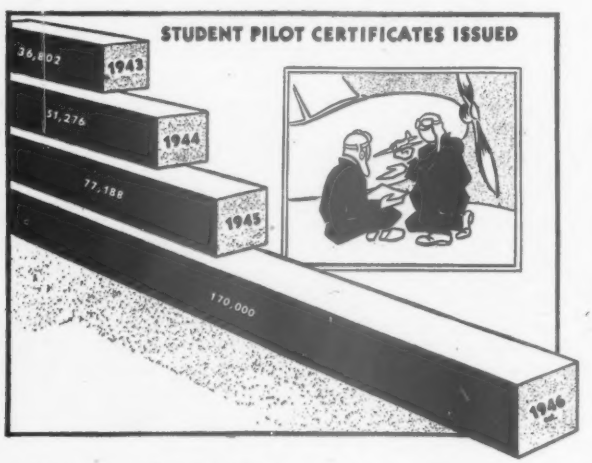
Private flying's growth is shown in this recent CAA chart.

Anyone who fails to recognize this fact has not examined the evidence closely.

The recent series of air accidents has not aided public confidence in the airlines, for example, and it has also had its effect on private flying. The undue publicity given to airline crashes, however, distorts the true picture of safety gains made during the past year. Public attitudes could be much improved, for example, if the average citizen could really understand that airline safety records improved greatly during 1946. Passenger fatalities per 100,000,000 passenger miles flown, for example, were reduced from 2.31 in 1945 to 1.47 in 1946—a remarkable gain and one quite incomprehensible to the average man who generally reads only the crash headlines in newspapers.

It was not too long ago that aircraft contracts were being cancelled in wholesale lots and the principal problem before the manufacturing industry was one of survival. Aviation entered 1946 with many of the problems of reconversion still ahead of it. As pointed out by the Aircraft Industries Association, there was indecision about production volume; AAF and Navy cutbacks were still coming through, programs were being revised, some economists had forecast high unemployment and consequent national defense budget slashes.

There were material shortages. Aluminum, thought to be in long supply, turned out to be scarce. Housing was taking most of the supply. Other materials—motors, fabrics, plastics—all were hard to get. There were problems of financing to cushion reconversion shocks. There were labor problems and there were personnel adjustments to be made.



Student certificates indicate extent of private flying in future.

Despite these difficulties, the industry produced planes, developed new planes, and began work on planes to be built in the years to come which, by pre-war standards, would be considered fantastic. Approximately 1,400 military planes and 450 transport planes were manufactured during the year.

But it was in the growth of personal aviation that the greatest gains were recorded.

At the beginning of 1946, there were 37,789 registered civil aircraft in the country. There were 85,000 at the end of the year—an unexpected and almost unheard-of increase. Despite the paean of despair which many of aviation's die-hards intoned throughout the year, 35,000 personal planes were built, nearly as many as existed altogether at the start of the year! In addition, nearly 10,000 registrations were added from surplus military aircraft purchased by civilians.

Private flying activities increased accordingly. The number of certificated pilots jumped from 296,895 to 400,000. Student pilot certificates issued increased from 77,188 to 170,000. Thus, counting only certificated pilots and the 170,000 student permits issued during the year, personal plane builders of 1947 will have 570,000 pilots to whom to sell their wares.

Looking into 1947, T. P. Wright, Civil Aeronautics Administrator, says:

"The great number of student pilots certificated during 1946 can be converted into active pilots in 1947, if personal flying is made more attractive by better aircraft, more airports, and sensible regulation. On the other hand, we can repeat the pre-war cycle of disillusioned pilots selling their aircraft because they lack utility proportionate to cost. I look forward confidently to continuing gains."

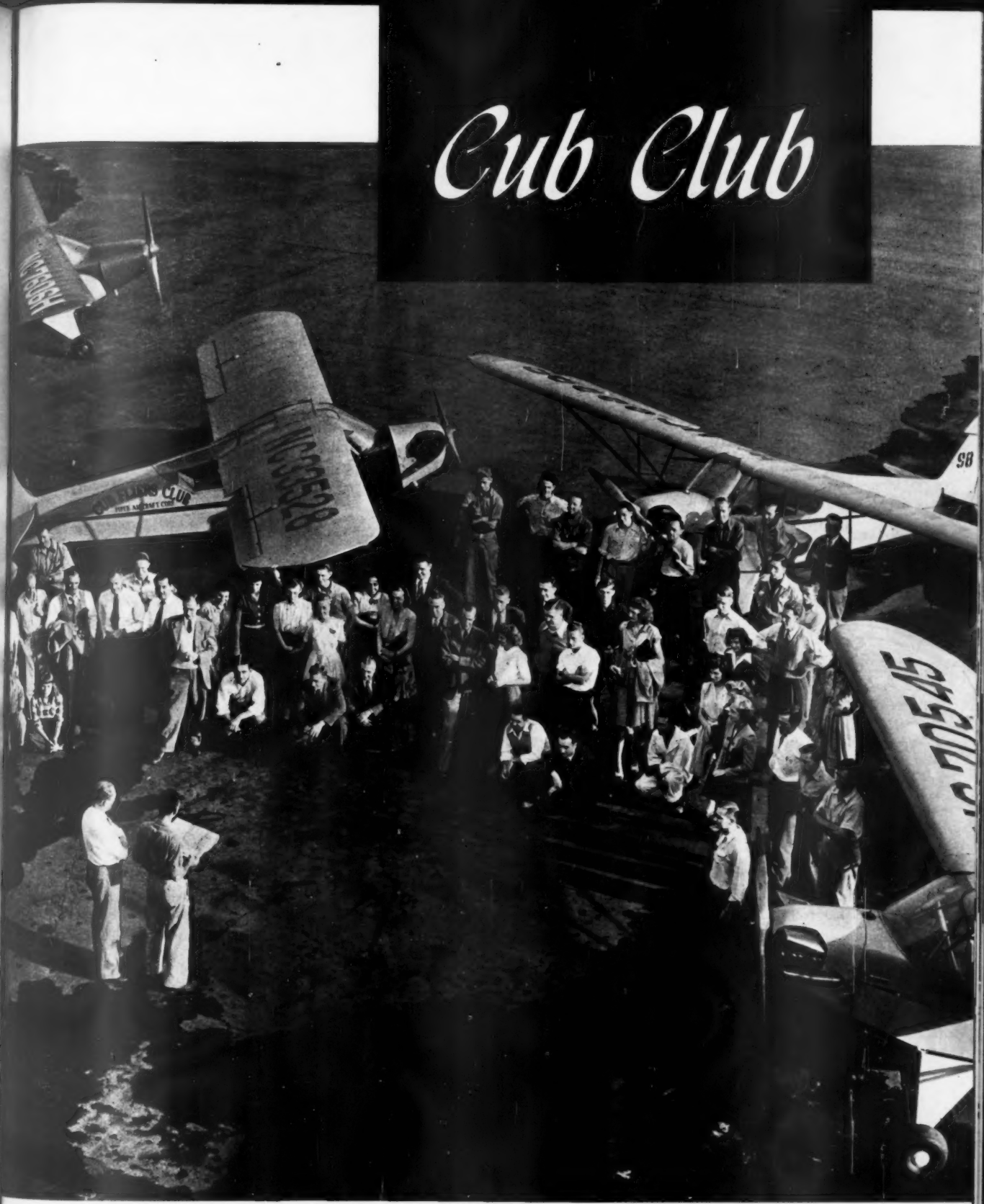
The aircraft industry generally was in a healthy financial condition, although four of 11 companies issuing interim reports cited losses for the 1946 period. The value of the industry's 1945 production was about 10 billion, while the value of 1946 production, including a large amount of experimental work, was around one billion.

Military production should increase this year to 2,500 or 2,600, AIA estimates. Dollar volume and air frame pounds will increase because of production of very heavy bombers in the B-35, B-36 and B-50 class. This forecast must be hedged against a possible trend to stringent economies in the national budget which may extend to AAF and Naval aviation appropriations.

Production in the personal plane field, as the Aircraft Industries Association points out, will be determined largely by the element of salesmanship, plus the availability of facilities for private flyers. Several personal plane companies ran into financial difficulties in the year just closed but they are expected to be back in the brisk competitive market before 1947 has run its course. The market for trainers and other two-place lightplanes seems fairly well saturated. A number of manufacturers now are turning to production of four-place business and family planes.

A FLYING survey of personal plane manufacturers in mid-January revealed a backlog of 15,230 orders for planes of more than two-places among five of the six builders contacted. Omitting the Stinson *Voyager*, which also has a substantial backlog, planes on order include the Beech *Bonanza* 1,500; Bellanca *Cruisair* 1,008; North American *Navion* 711; Piper (*Continued on page 92*)

Cub Club



Cub Flyers assemble at Cub Haven for briefing before take-off on a Sunday breakfast flight—typical of the club's social activities.

The world's largest flying club and lowest flying rates are sponsored by the Piper Corporation at Lock Haven...

Cub Haven is the home of the Piper flying club as well as the airport for the Piper factory at Lock Haven. The club owns 11 planes and most of the others here were built in the factory during the preceding 1½ days and await delivery by club pilots.

Club member Shirley Ann Smith has her private license and recently won the Cub Flyers' safety contest.

By JOHN H. LANCASTER

New York Editor of FLYING

LARGEST flying club in the world is in a quiet little Pennsylvania town of 11,000 persons—Lock Haven, home of the Piper Aircraft Corporation. Piper's 11-year-old club has 302 members and 11 *Cubs*. Club members flew 9,500 hours in 1945 and averaged about 565 hours monthly in the past year—not including the *Cub* deliveries in which most members participate.

From June 3, 1945, to September 9, 1946, Cub Flyers, and a few others who are not club members, ferried 1,715 *Cubs* a total of 1,046,263 miles. Longest delivery from Lock Haven was 4,063 miles to Anchorage, Alaska, and the average trip was 610 miles.

The nation's largest flying club was originally sponsored by William T. ("Bill") Piper, company president, back in Bradford, Pa., when the company was known as the

The busy club requires a full-time clerk. She is Eileen Whittemore (left), collecting dues and scheduling flights.

Joining in to wash plane are Members Donald Peters and Pete Ryan. Club's low rates demand co-operation from all.

Club's president and instructor David Bump (right, below) does outdoor hanger flying with group of students at Cub Haven airport.

Mechanic Pete Ryan runs a 100-hour check on club plane (background) while Tom Berry (foreground) gives another Cub a routine inspection.

Pauline Cebulka (right) is the only woman A&E mechanic at Piper. She shows a club member the importance of a daily oil check.

Club Supervisor Ed Jahelka (top) briefs Helen Underhill and Shirley Smith for ferry flight. Below, pilots warm up new planes for take-off.

Taylor Aircraft Company, had 65 employees and was producing three planes a week.

Ever since 1935, when 10 employees formed the club and obtained permission to fly an experimental E-2 *Cub* with a T-40 engine, the club's fortunes have risen with the company. A year later it had 45 members. Then the company was turning out 16 *Cubs* per week and proposed that if the employees could produce 18 *Cubs* for two successive weeks they be given another *Cub*—thus the club's second airplane.

Fire destroyed the wooden structures of the *Cub* factory at Bradford March 17, 1937, but production continued. In July the plant was established at Lock Haven and the firm name changed to Piper Aircraft Corporation. From then on the club grew rapidly, and indeed many workers came to Piper simply for the privilege of joining.

The Cub Club has the lowest rates on record. After a $1 initiation fee, members pay $3 annual dues and $2 per flying hour. Ten cents of the $2 goes to pay insurance and 40 cents is used for clubhouse expenses, including lounge rooms, offices and recreational facilities. The insurance provides $2,000 for death; up to $2,000 for dismemberment; $500 medical reimbursement, and $10 weekly for disability up to a year. The same rate is applied to members engaged in delivery flights.

The club's safety record has been impressive. There have been two fatalities. Major accidents amount to 0.3 per cent and minor to 0.2 per cent. They are kept down by a system of fines up to a maximum of $200 which replaced the old method of grounding rule breakers.

Of course the $1.50 per hour remaining from the original $2 per hour payment does not cover expenses. Piper furnishes the difference, the planes and maintenance, and pays the salaries of three instructors, Ed Jahelka, *Cub Flyers'* supervisor, and Miss Eileen Whittemore, scheduling clerk.

Current president of the club is David Bump, an instructor with over 4,000 hours. Other instructors are Gill Newman, chief instructor, and Marion Humphries.

Cub Flyers presented the armed forces with over 250 pilots during the war. They were proud to have learned to fly in the world's biggest flying club. END

Visiting pilots sweat out written private or commercial examinations in club house. Of 300 club members, many have licenses.

Frank Valcourt, machinist, lifts Cub's tail, says, "It would have taken both of us to do this with my 1918 British Avro K."

Seaplane ratings are held by 40 club members, and they have a seaplane which lands on and takes off from nearby Susquehanna River.

A **shark**, swift and deadly, mouth agape and gill slits open, is this jet-propelled fighter — the P-80.

A **housefly**, compound eyes peering vacantly from triangular face, is an Ercoupe.

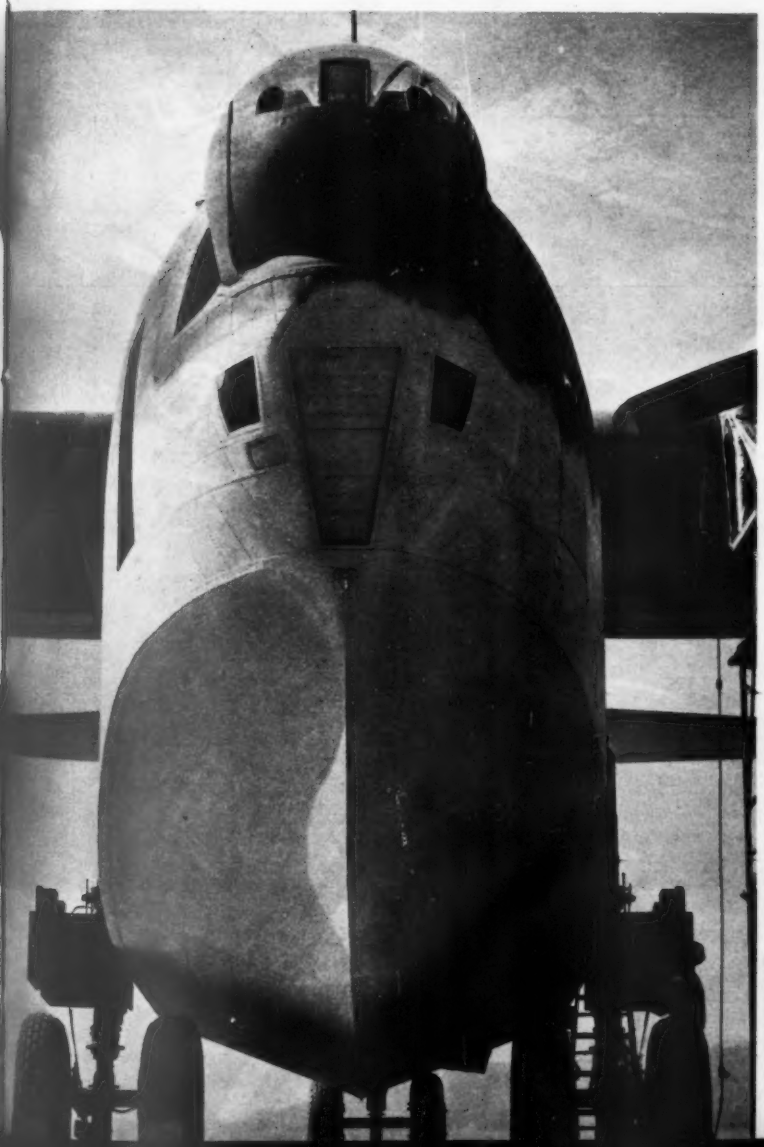
NOSIES

AS AIRCRAFT designers seek ever-greater plane performance, their creations resemble more and more the prototypes of a weird animal zoo. Nature designed animals for utility and it is not coincidence that plane faces should resemble animal faces. The bulging frog eyes of the XB-43 are also needed to see. The shark nose of the P-80 is vital to speed; its air vents, like the shark's gills, are necessary for breathing. In developing design efficiency, both nature and the engineers find similar solutions. This fantasy has possibilities for a new game of "Nosies." Can you tell a plane by its face?

Frog eyes mounted in bulges, and frog legs flexed for take-off give unmistakable appearance to Douglas XB-43 bomber.

Bat face with mouselike ears and tiny eyes turns out to be the Curtiss XP-55, low-wing canard fighter.

Swordfish snout on Beech's XA-38 is a 75-mm. cannon—even more deadly than the spear of its seagoing counterpart.



Penguin-like, the Boeing XPBB-1 waddles out of water onto dry land. But unlike the penguin, this creature flies.

Navy Skymasters are checked by mechanics in former Moffett Field dirigible hangar under new NATS progressive maintenance plan.

Revolution in Maintenance

Major overhauls are eliminated in new progressive maintenance plan for NATS Skymaster fleet

MAJOR overhaul has become an extinct method in servicing airplanes of the Naval Air Transport Service, which has substituted a time- and money-saving maintenance plan for its fleet of Douglas R5D (Army C-54, airline DC-4) transports.

The new system is known as "progressive maintenance," and has been so successful to date that airlines and other commercial operators are now beginning to seek information on the NATS method.

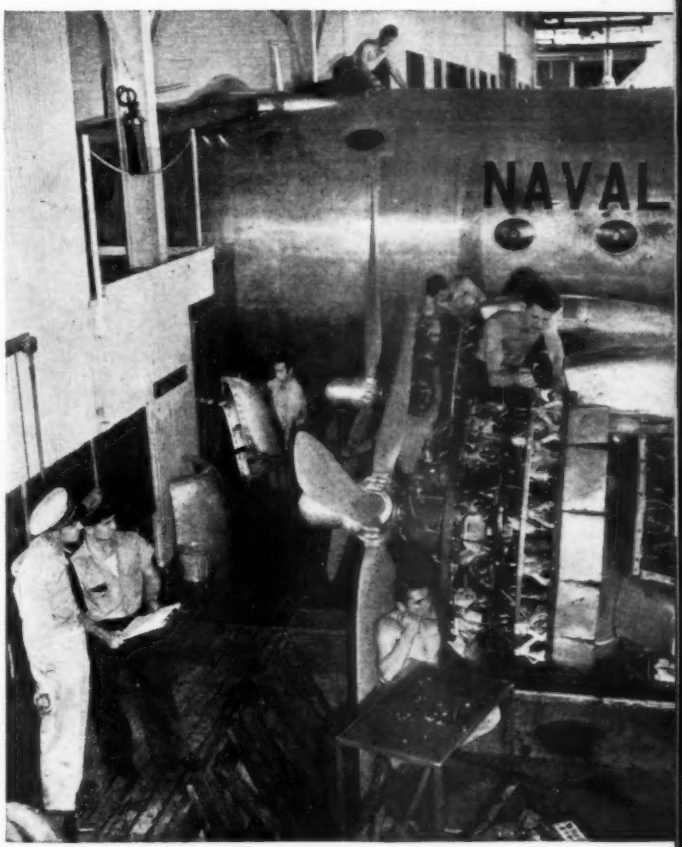
Principal benefits are safety and overall cost savings, according to Rear Adm. J. W. Reeves, Jr., commander of NATS, which is based at Moffett Field, near San Francisco, Calif. Admiral Reeves says it also may be called "preventive maintenance" because the method is used to perform maintenance work when it is needed, rather than at some arbitrary time.

There is no longer any such thing as major overhaul on the big planes, because much of the general work which was done during a major overhaul teardown now is accomplished in a systematized, progressive repair plan begun from the time the plane first takes to the air and continued up through the time it is taken out of service.

At the end of the 3,600-hour check, which is approximately equivalent to the fourth complete engine change and the regular major overhaul period for commercial carriers, there is practically no major maintenance work that hasn't already been completed.

At a given number of hours, certain phases of work are completed that under the old plan would wait until the major overhaul period. Every part of the airplane is inspected and repaired or replaced, if required, at varying intervals of operating time. This provides NATS with usage data on parts and on the average life of parts, from which they will benefit in later maintenance work. It also eliminates unnecessary operations.

Here is where the safety angle comes in. The plane is safer, system after system and structural member after structural (*Continued on page* 68)



NATS mechanics at Honolulu swarm over Skymaster engines, doing progressive maintenance to carefully preset schedules.

New NATS Book

Operation Lifeline, *the complete story in text and pictures of the Naval Air Transport Service, was published February 28 by the Ziff-Davis Publishing Company, publishers of* FLYING. *Pictures for the book were taken by Joe Rosenthal, who photographed the famous battle scene of Marines raising the American flag on Mt. Suribachi, Iwo Jima. The text was written by James Lee, Washington correspondent and writer.* Operation Lifeline *will be sold in all book stores.*

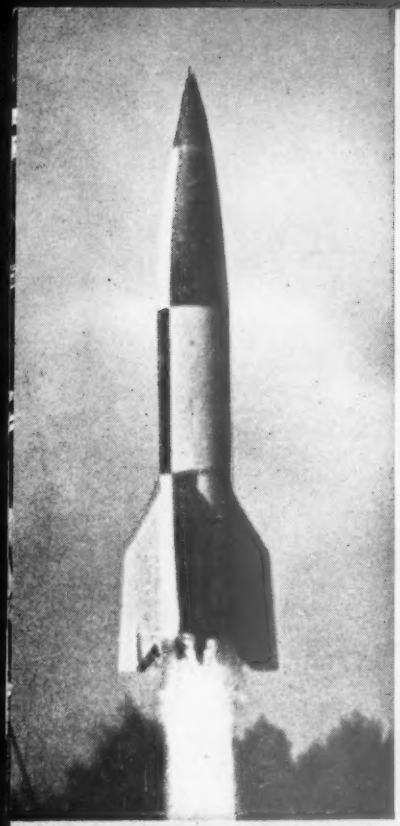
Uncle Sam 'Discovers' the Rocket

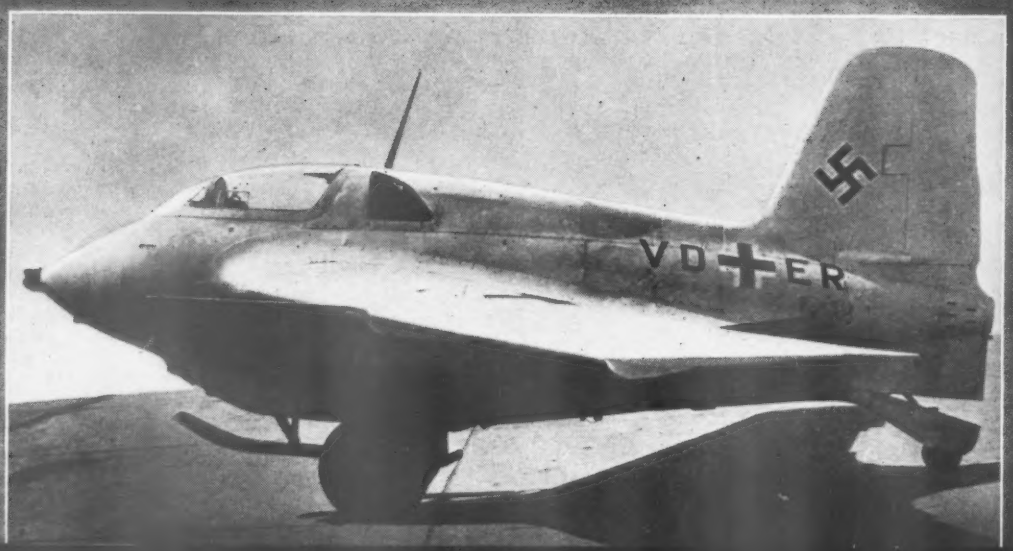
By CURTIS FULLER

Managing Editor of FLYING

LAST December 9 a handful of civilian scientists, manufacturers' representatives and AAF officers watched a tiny brightly-painted airplane cavort in the skies above Muroc Army Air Base in California. The plane had been carried to an altitude of 27,000 feet by a Boeing *Superfortress* and released. For 19 minutes it climbed, dived and banked in wide turns. Occasionally a white brush-like tail etched the blue sky behind the craft. It finally glided to a high-speed landing on the level runways at Muroc—the first publicized flight of an American rocket-propelled airplane. Actually, however, Northrop's tiny XP-79 experimental flying wing had flown on rocket power more than two years before, and though the single motor developed only 200 pounds of thrust, the late Harry Crosby who piloted it and not Chalmers ("Slick") Goodlin who pilots the XS-1 probably should get credit for first flying an American rocket airplane.

It is a question whether that honor is really (*Continued on page* 72)





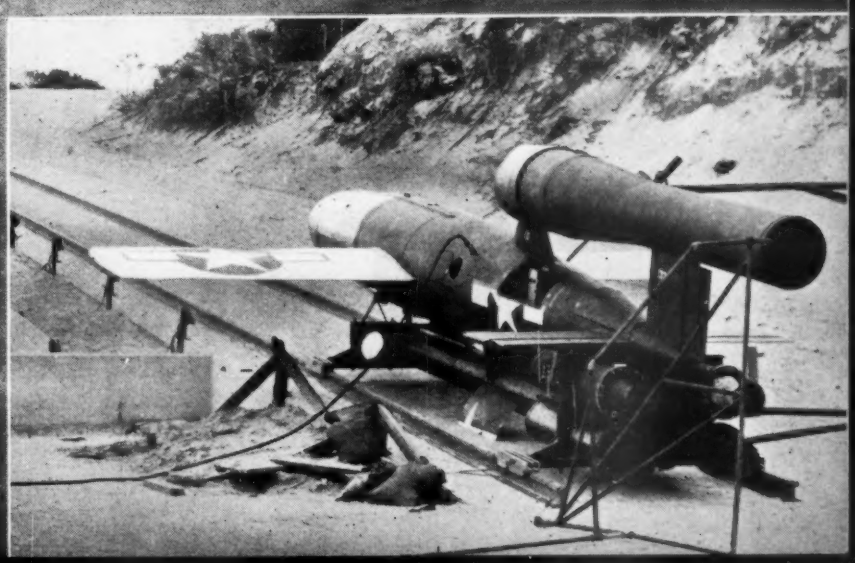
German rocket development reached its peak with the V-2 (above) and the Me-163 fighter (below). We have yet to equal the performance of V-2 and to develop a rocket plane as thoroughly tested as the Me-163.

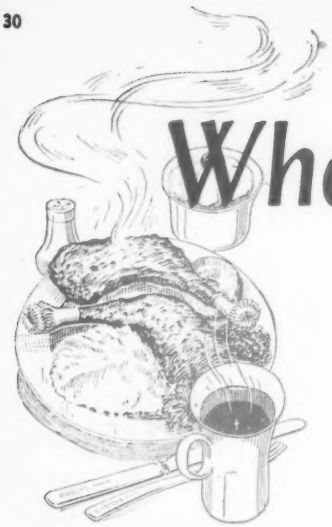
At last we have decided that rocket scientists aren't all crackpots wanting to fly to Mars.

The Bell XS-1 was developed as a supersonic test plane. So far it is our only rocket craft, though the Germans used rocket interceptors successfully in combat. The U.S. copy of V-1 (below) is represented as an "improvement" over German original, but Germans developed first weapons of this kind while we rejected early proposals to build them.

'FATHER OF ROCKETS'

The late Dr. Robert H. Goddard of Clark University is credited with writing the fundamental rocket equation, flying the first liquid-fueled rocket, and many other firsts. His studies were used by German scientists but generally ignored in the 1930's by the U.S. armed forces.





What to Eat When You Fly

By
T. KENT MORRIS
International Secretary,
International Stewards' and Caterers' Association, Inc.

Food for air passengers is carefully planned by dieticians who know effect of altitude on digestion.

Many a pilot finds his stomach wasn't built for flying. Feeding the airman is a special science for trained dieticians.

Dressing up a salad in an American Airlines kitchen. Aviation caterers have learned that such food must be served attractively.

ADEQUATE FOOD of the right kind is as important to the physical efficiency of the flying man as is gasoline of appropriate octane rating to the aviation engines which power his aircraft.

Care and feeding of the airman calls for special, informed attention because man is out of his natural element in the air. When he leaves the surface of the earth on man-made wings he relies on exactly the same mind, nervous system, and internal organs that serve him aground but which are not all adjusted to life above the clouds.

Here are some of the factors affecting the physical and mental state of the air crew member or passenger:

1. Being airborne, he misses the stability of having both feet on the ground. Just as a boat trip requires one to acquire "sea legs," a flight requires a similar adjustment.
2. Being in motion takes its minute but cumulative toll of nervous and physical energy.
3. The sound of the engines and propellers makes its impression upon the mind in a manner which also is cumulative, even in modern airliners with their efficient acoustical engineering and sound insulation.
4. The vibration which passes through the frame of the aircraft and is transmitted to the air travelers' bodies adds its effect, which also is minute at any one time but is cumulative like the others.
5. Altitude has special effects which will be discussed in greater detail later.

None of these first four factors has any perceptible harmful effect except in injudicious eating or drinking. The same is true of high altitude as long as standard procedures for supplying supplementary oxygen or pressurized air are carried out.

Therefore, a little foresight in the selection of food and drink before, during, and even after a flight is excellent insurance against discomfort and possible loss of physical efficiency.

The flyer should be constantly alert to the vital necessity of sensible eating. Likewise, those who cater to flyers must consistently plan and provide foodstuffs and meals in full realization of the special demands of aviation.

Of the five special considerations affecting the physical well-being of airmen and air passengers in flight which already have been listed, only altitude introduces problems that are really new and different.

The basic cause of interference in certain functions of the human system at altitude is the decrease of oxygen in the blood. At normal levels for airline flying—5,000 to 10,000 feet—the effect is measurable but not distressing or consequential. At higher levels it becomes increasingly significant.

The functions of the digestive organs are slowed up some 33 per cent at altitudes of 10,000 feet and upwards. Body temperatures are much more readily dissipated with a resultant heavier consumption of "fuel" units in the system. The heart muscles and respiratory system have to work overtime. This results in a heavier demand upon the essential mineral elements in the blood stream, with consequential diminution in the supply of calcium, sodium and potassium salts.

Meals must be easily digested, high in caloric value, contain enough minerals to offset the heavy demands upon these elements.

Another important consideration in the diet of airmen and passengers is the quantity of food taken previous to and during a flight. The average person probably eats far too much. Because intestinal gases form at high altitude, and because the digestive processes slow up, the amount of food eaten before and during a flight should be greatly curtailed.

On the other hand, the opposite extreme of no food at all before or during a long flight should not be practiced.

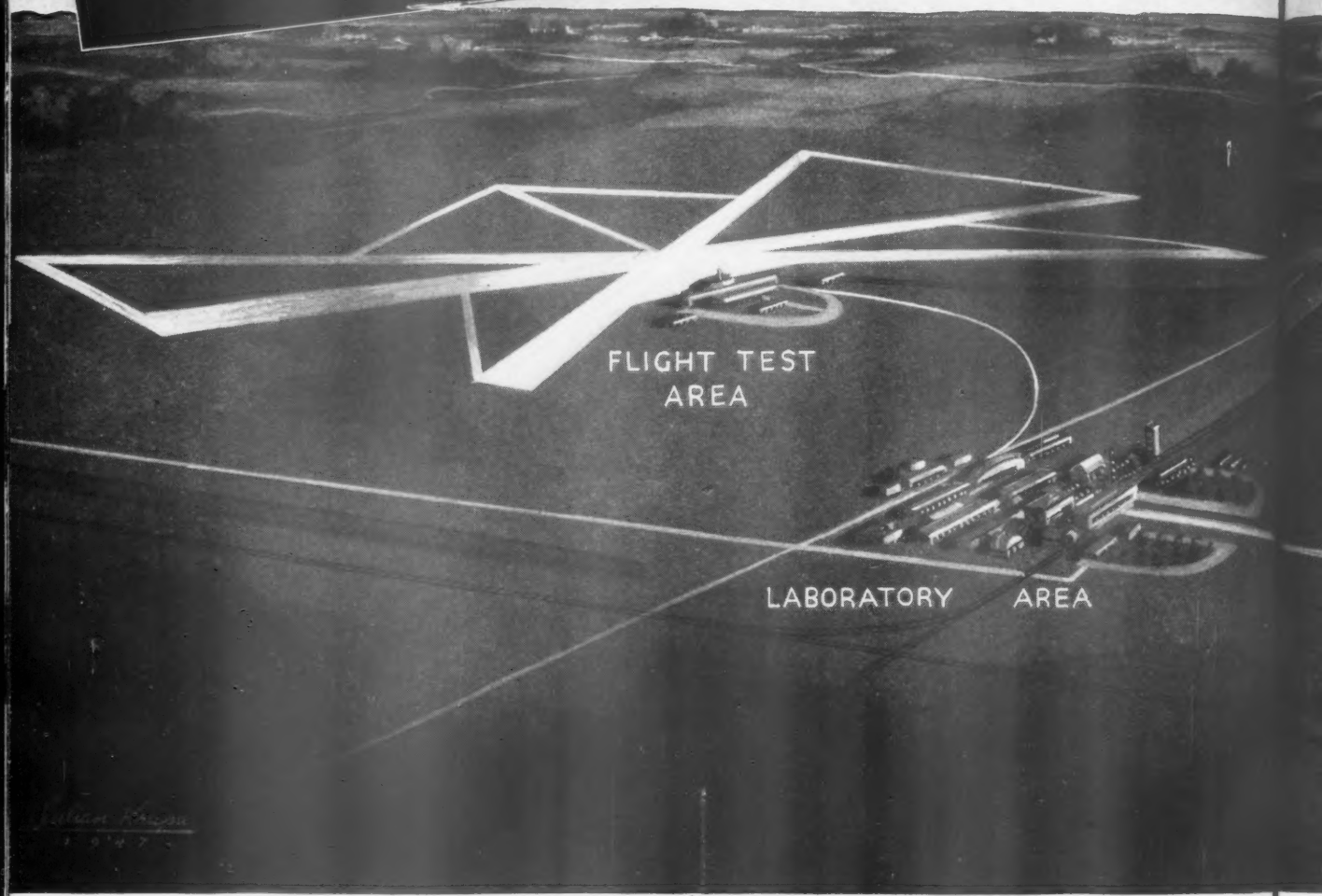
Four specific foods requirements are important:

1. Food of easiest digestion.
2. Food to provide additional fuel units.
3. Food items to balance the "overwork" experienced in flight.
4. Food to avoid.

Roast or baked, broiled, steamed or boiled meats and poultry (except pork and game); fresh fish (except certain shellfish); well-cooked vegetables and light desserts are easiest to digest.

Food to provide extra "fuel" (*Continued on page 87*)

Home of 'The Impossible'



By MARGARITA DOBERT

Washington Staff of FLYING

IF A drive by the Army Air Forces succeeds this spring, Buck Rogers will have a permanent home to make even him gasp in wonder.

Under the unrevealing title of the "Air Engineering Development Center," AAF plans call for a world-of-the-future community occupying approximately 100 square miles, housing 16,000 persons and needing a power supply of a million h.p. A small fortune already has been spent on surveys to determine a site—it must be far from other communities and near tremendous waterpower, and probably will be somewhere in the west—and a total of $600,000,000 is being asked to get the center going full swing.

What will happen when it does get going is where the Buck Rogers aspects of the work come in—and it also gives more than a hint of what the AAF is thinking in terms of future national defense if war ever comes again.

The AAF believes that World War III, if it ever comes, will have supersonic pilotless aircraft as the main striking force, carrying atomic warheads and guided to the target by remote control. Supplementing these will be bomber planes capable of going around the world with full load, fighters with transoceanic ranges, and supersonic interceptors capable of brief, deadly forays against enemy attack.

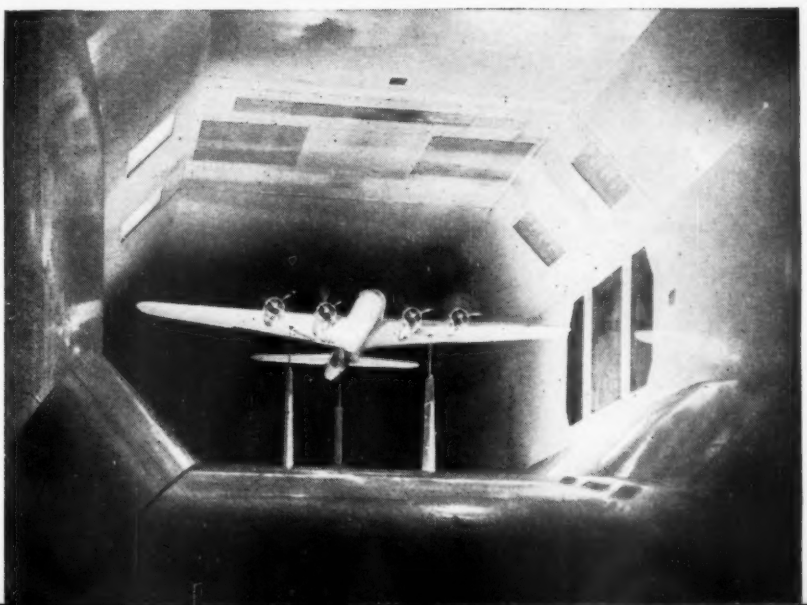
Defensively, radar will be the chief weapon, aided by intercepter bombs to set off the pilotless atomic warheads before they reach the target. Electronic "detectives" to discover the enemy bases and report the progress of a bomb or plane launched at supersonic speeds will be employed at widespread points over the world. And most of the fighting and exchange of explosives will go

NOT TO BE TAKEN FROM THE
YALE CLUB LIBRARY

The AAF plans a Buck Rogers air laboratory where million-dollar wind tunnels will be the test tubes.

GENERAL SITE PLAN OF THE AAF RESEARCH CENTER

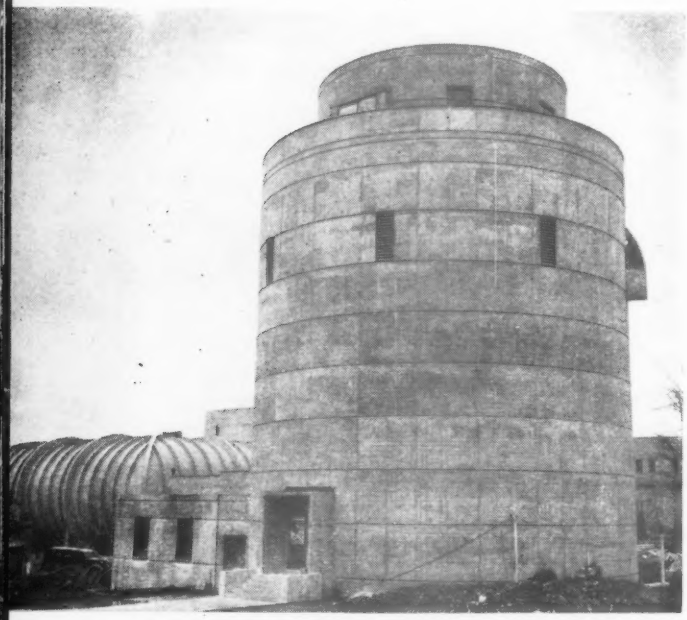
General layout of the AAF research center (above) shows test areas and laboratories which will house equipment for every sort of mechanical, chemical, electronic and aerodynamic experimentation. There will be numerous hypersonic wind tunnels as well as subsonic units like the 700-m.p.h. cell at Boeing's Seattle plant (right). Housing areas for the 16,000 workers the center will employ are not shown.



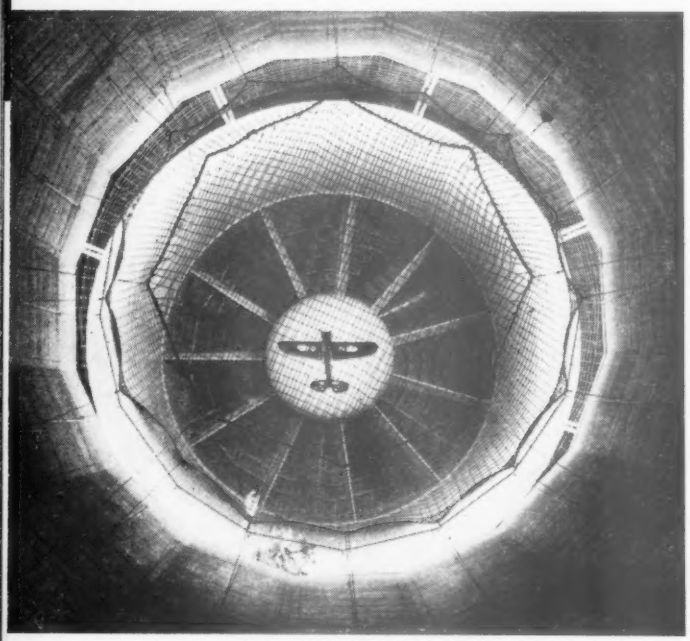
on at heights beyond any that yet have been explored.

To implement this fantasia of defense is the purpose of the AAF base. Air Forces experts say it would make Wright Field seem as antiquated as the original Wright plane. Every scientific aspect of the world of tomorrow must be explored and developed, and the new super-base would be designed for exactly that purpose. Plans call for the largest research and development center the world has ever seen.

At present the most powerful wind tunnels at Wright Field, for example, are 20-foot and 10-foot tunnels, each utilizing 40,000 h.p. The new center would have five wind tunnels, using from 75,000 to 150,000 h.p. for testing speed ranges from 9/10 to more than 10 times the speed of sound.



Vertical wind tunnel (above) at Wright Field is powered to test free-flying scale models (below) in wind velocities of "better than 100 m.p.h." But it will be antiquated by units planned for new research center where testing speeds will range up to 10 times that of sound.



The wind tunnels would also serve to explore the still unknown regions of thermodynamics. Robot bombs, guided missiles, rockets and propellerless aircraft depend on jet reaction or energy in the form of heat for motive power. Experiments during World War II were based on a system of trial and error rather than upon a systematic exploitation of known data.

The center would include specialized test facilities to study heat transference and insulation, combustion chamber phenomena, new and more efficient thermodynamic cycles for propulsive devices, the use of nuclear fission as a source of energy, and a host of other thermodynamic problems. For other tests a number of rocket or jet reaction launching stands similar in design but varying in size are proposed. These would be below ground or behind substantial bulwarks to protect personnel and nearby equipment.

The control room for test instruments and operators would be at a distance, surrounded by massive concrete walls. Most thermodynamic data will be recorded by telemetering and other signal transmission systems. Large capacity underground fuel storage tanks containing liquid oxygen and other fuel components would also be needed, as well as hot and cold chambers to conduct insulation and heat conduction tests and for checking operation of various components.

AAF scientists believe that elaborate material research is necessary for flight at supersonic speeds. This applies not only to the propulsion unit but to the structure of the airframe of the missile or plane itself. The efficiency of a structure again is so intimately related to the materials of which it is composed that the development of one is inextricably involved with the other.

The lightest container for the transport of men, machines and explosives which will still meet the aerodynamic and strength requirements must be developed. The gas turbine, rocket, perhaps nuclear power units, will depend on metals which will maintain their strength at red to yellow heat, while space ships may carry loads at near absolute zero temperatures. New elements or isotopes may be created which hold the key to high temperature alloys—or plastics may one day be suitable for use in the temperature and pressure ranges encountered.

To explore these questions, AAF proposes extensive equipment to develop and test metals, alloys and plastics —furnaces, forges, presses, and rolling mills. A special physical test area would house tensile and hardness test machines, specimen fatique equipment, photo-microscopes, electron microscopes, spectroscopy and X-ray equipment. A chemical test area would house laboratories and test rooms for chemical analysis of materials, while the structures test area would provide set-up and test space for complete airframes and their components.

Special equipment for electronics also is proposed. The electronics field would include radio control, telemetering, navigation, radar, loran, television and homing devices. In addition, there would be the wave phenomena laboratories to develop equipment powered by magnetic and sound waves or various rays, such as light, cosmic, X, alpha, beta or gamma.

The possibility of constructing stations for controlling missiles remotely, here and on island outposts, would be investigated. Automatic repeater stations such as are now used in television and frequency modulation transmission would be developed to guide missiles over long distances.

Various controls of the pro- (*Continued on page* 98)

One Air Law—or 49?

A FEDERAL AUTHORITY DISCUSSES STATE AIR REGULATION

By MERRILL ARMOUR

Assistant General Counsel, Safety, Civil Aeronautics Board

Merrill Armour

THE slow but continual growth of Federal, state, county and city aviation regulations is becoming a critical problem to all who fly. State rules encompassing a field as broad as air traffic, competency of airmen, airworthiness, operation rules and taxes are growing with increasing speed.

The Virginia General Assembly last spring, for example, actually considered adopting a law to tax all flights over any portion of the state. This measure passed the lower house, and though it failed to be reported out of the upper house committee it indicates how far many persons would be willing to go in restricting aviation.

Behind this proposal apparently was the idea that since state-based planes paid gas tax in Virginia, those which did not purchase gasoline in Virginia should somehow be made to pay proportionately for using the air space above the state. But who (besides the majority of members of the Virginia lower legislative chamber) believes that airspace is a usable commodity for which each individual must pay? And if you do so believe, how are you going to enforce such a law?

In Connecticut all airmen must have a state license and pass a qualifying examination given by the state to get the license. Each private pilot must pay a fee to be examined annually by a state flight surgeon. A non-resident may not operate for hire within the state and a non-resident pilot must report to the Commissioner of Aeronautics if the pilot remains in the state longer than necessary to refuel or make minor repairs. All aircraft must be registered annually after an inspection, and there must be payment of a fee.

If you are relying upon the Federal air traffic rules to guide you in Connecticut you will fly into trouble. You must maintain an altitude of 2,000 feet over a crowded area. Whether the "crowded area" is to be interpreted like the term "congested area" in the Federal regulations you will have to study the Connecticut cases to know. You cannot fly under 500 feet no matter how safe it may be and you violate the law if you perform any acrobatics under 1,500 feet or any acrobatics with passengers. If you are a student pilot you must wear a parachute—except when taking off or landing!

Should you be flying over New York State you would have to take care not to fly directly over another aircraft regardless of the distance between you and the other aircraft. All your take-offs and landings in the state must be upwind and on a clear field if possible, regardless of the amount of wind. If you are carrying passengers you cannot deviate from the altitude rules of the state because of the stress of weather.

If you are the owner of an aircraft and have loaned it to some friend in Vermont you are liable for damages in case of an accident. Several states in 1945 authorized state agencies to pass rules and regulations governing all phases of aviation.

The problem, therefore, is not imaginary and prospective but is actual and immediate.

A comprehensive survey of state laws would show that aviation is comparatively free—so far—from conflicting state restrictions. But to visualize how this situation can develop look at the motor trucking business for which the states adopted rules and regulations long before the Federal Government gave consideration to the problem.

Consider the various state laws concerning lighting equipment for trucks, varying through a range of white, yellow, amber, green, purple and blue. Colors legal in one state break the law of other states.

Nine states require six "identification" lights—three on the front and three on the rear of the vehicle. The rear identification lights must all be red; but those on the front variously are required to be white, yellow, amber or green. Front lights which are green in Illinois violate the law in Iowa, where they can be either white, yellow or amber.

The "regulation control" over loading is even more chaotic. If you want to carry a truckload of goods from New York to Iowa, here are some of the things you will have to contend with and for which an Interstate Commerce Commission "permit" would not help: In New York you can use a 50-foot truck (*Continued on page* 84)

THE *Super Cruiser*

New panel includes two-way radio in center. Compass was put on panel top.

FLYING's CHECK PILOT

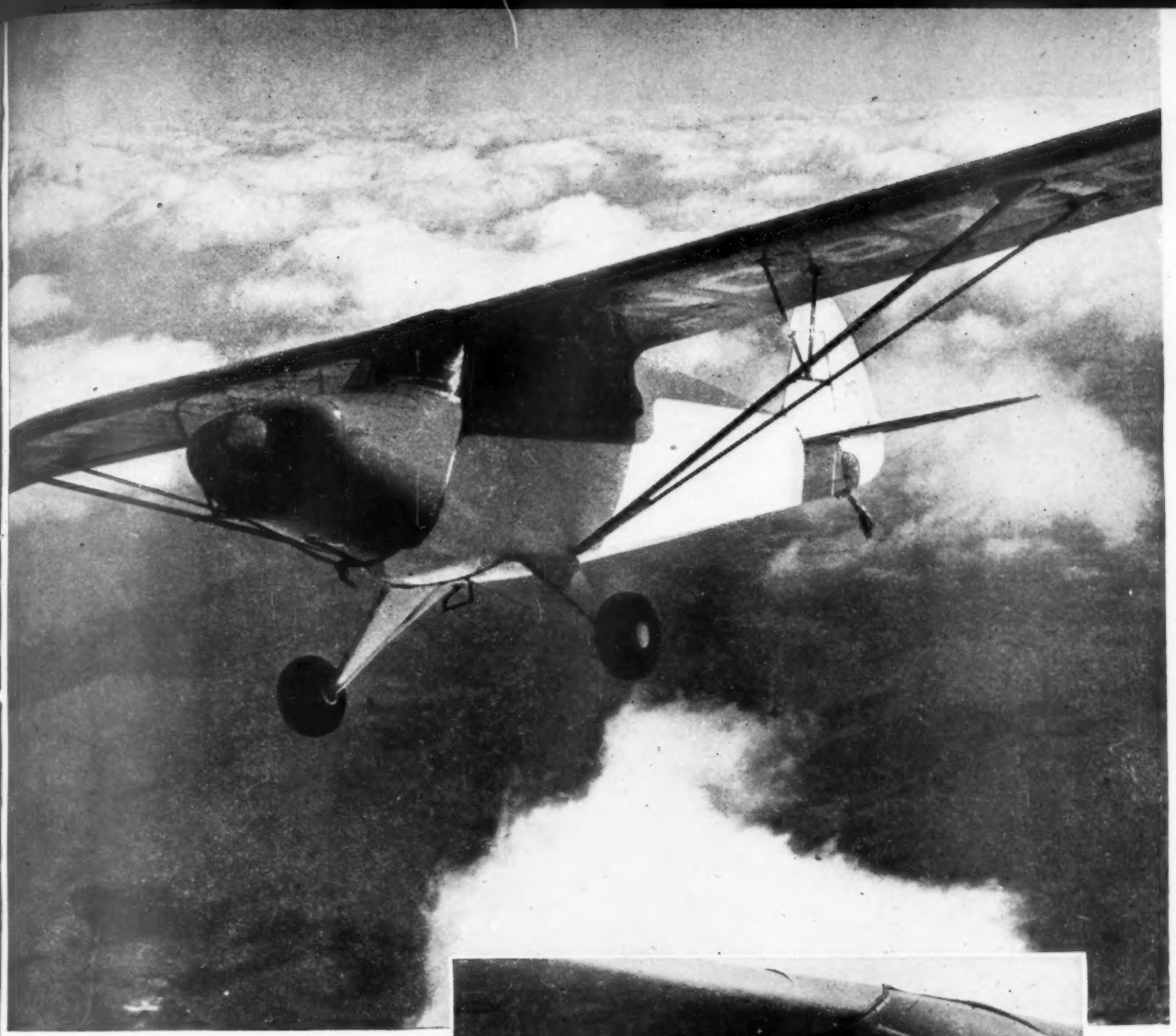
EDITOR'S NOTE

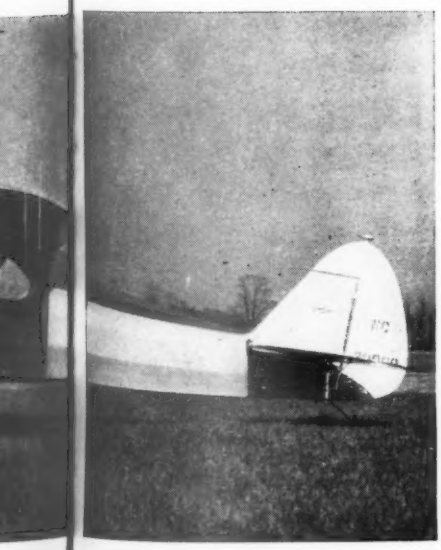
This series of articles is planned to help the pilot and prospective plane owner evaluate aircraft now on the market. Only aircraft holding a CAA Approved Type Certificate are flown. The author is not a professional test pilot. He evaluates each aircraft through the eyes of an average private pilot who flies an airplane either for business or sport.

JUST about the time you are convinced Bill Piper has finally milked his basic *Cub* design dry, he turns up with some new adaptation that almost inevitably opens up a whole new market. Take the old J-3 trainer (currently called the *Cub Special*), for example. There's little difference between it and the early *Cubs* of the '30's, with one exception. Piper is a past master at getting the greatest utility out of his initial investment. So, instead of the *Cub* design coming and going within a few years, it has gone on almost indefinitely, turning up periodically in some new and salable form.

While the tandem-trainer market is pretty well saturated at this point, Piper has been able to keep up a fairly brisk J-3 business in such intriguing off-shoot markets as that for crop dusters (there are more *Cub* crop dusters in use than all other types combined), and for general all-around farm work. And there's no telling where the old *Cub* is liable to turn up again, for if Piper can figure out a way to make a J-3 dig a better post hole, then you're sure to see plenty of the little yellow and black monoplanes buzzing merrily around the countryside, digging bigger and better post holes. During the war, a little olive drab paint and some extra transparent plastic made the J-3 into the Army's far-famed L-4, the most (*Continued on page* 96)

Sixteen years apart, these two Piper products symbolize the company's progress. A new Super Cruiser is shown facing one of the earliest Cubs, a 37-h.p. 1931 trainer that still flies. Trainers are built at Ponca City, Super Cruisers at Lock Haven.





Two passengers or a comparable load of cargo can be carried comfortably in the double back seat. Range is 600 miles fully loaded, cruising speed 105 m.p.h. Super Cruiser is licensed in two categories for wheels, floats or skis.

Portage utility is only one of the advantages floats give sportsmen flyers like W. L. MacAdams (left) of Boston and H. F. Troxel of Portland, Me., who flew Troxel's Aeronca into Canada on a recent hunting trip and brought back two deer on its floats.

Float Facts

Make a rugged boat hull that is light and aerodynamically efficient and you get a minor marvel, the seaplane float.

By ELMER J. CLINTON

Commercial Products Engineer, Edo Aircraft Corp.

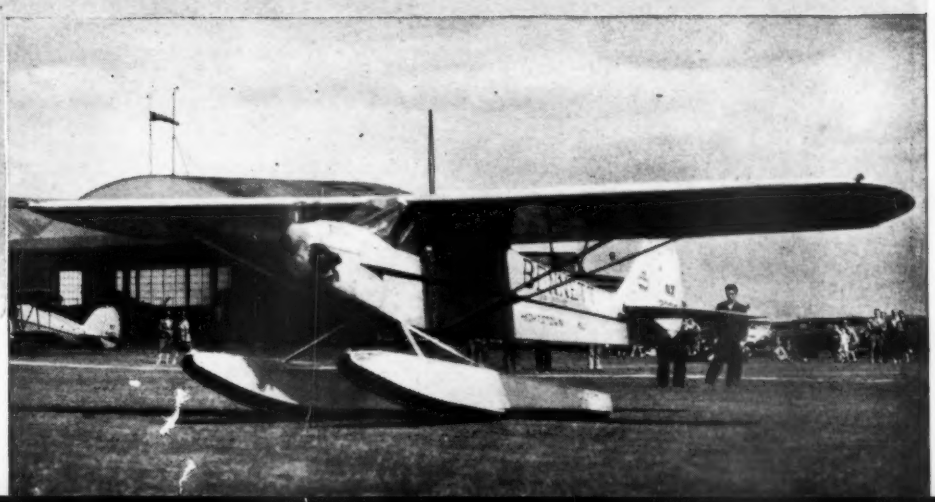
THERE are many mysteries about a pair of floats—at least to the average floatplane pilot. For instance, why does a floatplane sometimes require extra fin area? Will you sink if you punch a hole in the bottom of a float? How much do they reduce your speed? Why do floats seem to cost so much? And why use two floats if the Navy uses only one?

The answers to these and dozens of other questions add up to the fact that designing and building floats is a special science. The end result—two hulls attached to a plane—doesn't change the fact that good floats, which are light, strong, and won't leak, require a tremendous amount of design attention and demand meticulous manufacturing methods. To top such requirements, floats must be hydrodynamically correct for proper water handling and maximum take-off efficiency. And they must be streamlined for minimum drag. These add up to a set of conditions seldom encountered in any other airplane component.

The basic safety requirements which make floats about as non-sinkable as any structure afloat today are prescribed by the Civil Air Regulations, parts 03 and 04. First, to prevent the entire float from filling up in case of a puncture, CAR requires that, for floats under 2,500 pounds, there be four separate watertight compartments. As an added safety precaution, and for greater structural rigidity we have designed six watertight compartments in our small lightplane floats. Even if half the compartments were flooded, the float would continue to support its half of the airplane. This is true because of another requirement aimed at safety. The regulations state that twin-float

Amphibious float gear has seen vast improvement since this Waco installation back in 1938.

Largest floats ever built are those on this C-47. Designed for wartime cargo operations in the Pacific, each set weighed more than 5,000 pounds, cost $110,000.



"Dry landing" illustrates strength of modern float design. One airport uses them for normal snow operations, finds them better than skis.

combinations shall have a buoyancy 90 per cent *in excess* of that required to support the gross weight of the airplane in fresh water. Thus floats on a twin-float seaplane can not submerge until the seaplane is loaded to almost twice its normal gross weight. Single float requirements call for 80 per cent reserve buoyancy. Canadian requirements in this respect are now identical with those of the United States. Previously 100 per cent reserve buoyancy for twin floats was required in Canada.

Float models normally are designated in terms of displacement Thus our Model 1320 float when submerged in fresh water displaces a weight of water equal to 1,320 pounds. The added buoyancy of salt water would raise this displacement to 1,350 pounds.

The special manufacturing requirements of building watertight floats present problems in construction not encountered in airframe building. To make seams or the joints between bulkheads and sides tight, much closer riveting must be done than is necessary for structural requirements alone. For this reason, floats are able to take almost incredible beatings.

Because floats must be watertight and corrosion resistant, the various parts and components which go into them are built with such close attention to detail that mass production methods used in airframe structures must be modified and compromised. A pair of lightplane floats is built to precision and with care equivalent to that required on fuselage and wings of a fighter plane.

Testing for leaks is a very thorough process. Before the deck is installed, alternate compartments are filled with water so that any bulkhead leaks may be detected. Then all the compartments are filled with water and thoroughly examined for outside leaks. Leaky rivets are redrilled and new ones inserted and caulked.

All this talk of rivets and caulking may pose the question: "Is metal the answer for floats?" It is true that other materials are used for lightplane floats. However, from the standpoint of length of service, ruggedness and repair we are firmly convinced that metal is best. On light floatplanes the problem of "hydroscopic weight" is one which must be considered very seriously. This is extra weight picked up by wood or other non-metal surfaces after they have been in water for a period of time. The addition of 20 or 30 pounds of hydroscopic weight in the floats of a lightplane, can make the difference between satisfactory and unsatisfactory performance. Metal, of course, does not absorb water.

This special care in manufacture explains why floats seem to cost as much as they do—25 per cent to 50 per cent of the price of the aircraft on which they are to be installed. It would be possible to build floats a little less carefully, but the resulting weaker structures would create leaks in hard usage and the floats would deteriorate too quickly. The over-all cost to an operator or private owner, were it necessary to replace floats after several seasons, would be much higher. In many cases metal floats have outlived the airplanes on which they were installed.

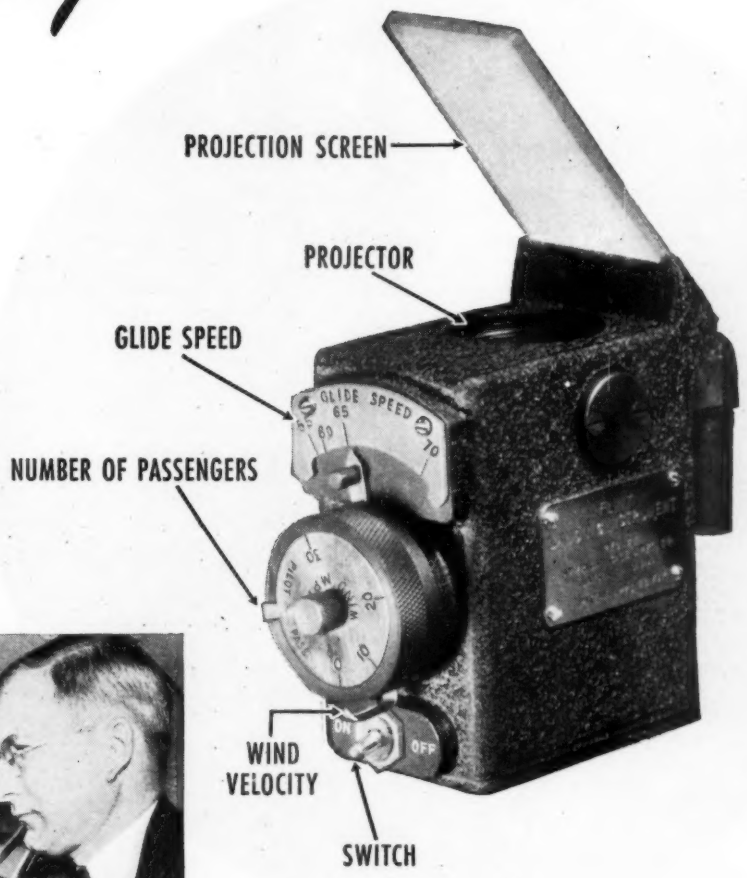
In addition to higher manufacturing costs, there is also the cost of engineering development and tooling which must be absorbed in each set of floats sold. The design of a new float model represents approximately $70,000! That would mean that for 1,000 sets of floats, $70 would be represented in the cost of each unit in engineering and tooling cost alone. Until the present, the annual demand for floats has been in terms of several hundred sets—meaning an even higher allowance for design costs per unit. The initial design and stress analysis work on the struts alone for a new model plane runs around $2,000.

Fortunately, much of this explanation of the high cost of floats is a matter of the past and present. The immediate future foresees considerable progress in less expensive floats without any sacrifice in strength, durability or performance. A greatly increased demand has indicated the practicality of volume float production. Enlarged production facilities, modern tools, and machines acquired during the war to make military and Naval floats permit redesigning our lightplane floats for simpler production methods.

The first of the newly-designed (*Continued on page* 82)

Water tests during float manufacture involve flooding every other compartment to check leaks through bulkheads. In final test, all compartments are filled to check for outside leaks. **Edo Model 1320** (above) is for lightplanes.

LIGHTPLANE LANDINGS— *By Bombsight*



Landing sight (right) uses correlated settings of glide speed, weight and wind velocity in bending ray of light through projection screen as sight for spot where normal glide will land plane. Inventor Earl Flint (below) shows how the device is installed.

Here's a war-born idea that promises sharp-shooting skill for spot landings.

By KEN DAVIS

A NEW instrument invented by Aviation Researcher Earl E. Flint of Wright Field will tell you the exact moment to cut your lightplane engine for the most precise spot landings you've ever made. What's more important, it will tell you just which of the available areas you can hope to reach in a forced landing.

In actual use, the Flint landing sight is nothing more than a dot of orange light projected from a box less than four inches tall and two inches wide. It weighs only two pounds and was designed specifically for lightplanes. But it is possible, with slight changes, to produce similar instruments for heavier planes. And the AAF is considering a glider adaptation that may make mass landings a quicker and safer business.

(In combat, gliders are cut loose from the towplane downwind from the target, then circle 190° and come in one by one. With the Flint instrument, its inventor declares, the gliders could cut loose upwind and land in formation without that slow turn.—Ed.)

Development of the instrument actually began before the battle of the Bismarck Sea when Flint, a gas engineer turned aviation researcher at Wright Field, developed a

low-level bombsight at the Air Materiel Command's armament laboratory. Flint combined electrical and optical devices in the skip-bomb sight, which was accurate up to 500 feet. The instrument, when correctly set for altitude and air speed, projected a bullseye on the point where the bomb would strike. The bomb was released from the plane when the bullseye coincided with the target.

Flint completed his bombsight late in 1942 and it got its first real battle test in the air over the Bismarck Sea March 5, 1943. American pilots lined up those bullseyes to sink 22 enemy ships, putting out of operation 82 enemy aircraft and killing something more than 30,000 Japanese troops.

It wasn't until long after his bombsight had helped win the war that Flint started thinking about a peacetime adaptation of the idea.

"It finally occurred to me that the principle of the bombsight could be twisted to provide a ready means of determining the moment to begin a safe landing glide," Flint relates. "The idea was so simple, it startled me."

What Flint eventually came up with, after months of testing and remodeling, is no more intricate to operate than a gun sight. (Actually it resembles certain gunsights even more than it does the conventional bombing gadget.)

Only three factors influence the landing of a plane—wind velocity, glide speed and plane weight. Altitude is not a factor. So far as lightplanes are concerned, the only variable is wind velocity.

That means the pilot using the Flint instrument has only three simple settings to make. He sets the glide speed, usually at 65 m.p.h.; the wind velocity, either by judgment or by radio contact; and turns a dial to allow for the added weight of a passenger if one is carried.

"Inexperienced pilots," said Aeronca's chief test pilot Lou Wehrung, "will find the instrument so simple it can be adjusted in 30 seconds."

After these simple settings, the pilot flips a toggle switch and approaches the field according to CAA regulations.

A dot of orange light is projected ahead of the plane and appears to be racing along the ground. When the dot reaches the point where the pilot wishes to touch down, he cuts the engine and begins his landing glide.

Curious as to the accuracy of such a procedure, Wehrung spent one entire day shooting landings from upwards of 1,600 feet. Never, he said, was the actual landing more than a plane's length from the exact spot he picked with Flint's little bombsight gadget. The device actually added sharp-shooting accuracy to his landing techniques.

Behind that astonishing accuracy were months of work in producing the first experimental model which looked little like the sleek affair which the American Gauge and Manufacturing Co. of Dayton, O., now is turning out. Constructed in Flint's basement workshop, it weighed 45 pounds and was a pretty crude device.

It contained the basic design ingredients, however, and Flint installed it in a rented L-3. Three test runs with a pilot friend, Robert Hallenbaugh, convinced him that he was on the right track.

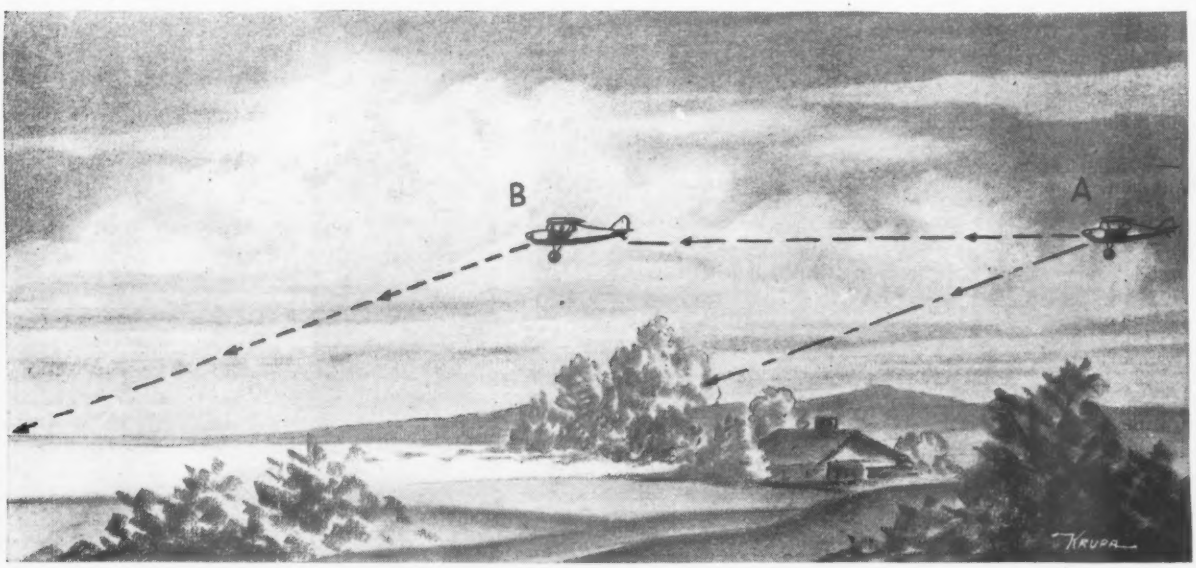
The Dayton firm took over the construction of subsequent experimental models and Wehrung the test flying. It wasn't long until Wehrung was telling the boys the instrument was "exactly what the aviation industry was searching for."

"It is so accurate a pilot can land on the exact spot he selects while still hundreds of feet in the air," he said. "In event of a dead motor, the pilot will know long before he reaches a prospective landing space whether he will be able to maintain altitude enough to land there."

Wehrung and Aeronca officials were pleased with the gadget because there is no simple device for guided lightplane landings on the market. Radar is too complicated, bulky and expensive, and the beacon system too complicated and costly.

The Flint instrument is both simple and small. For planes with batteries, it weighs only two pounds installed. Without a battery in the plane, the installation tips the scales at five pounds, using six volts of electricity for operation.

The device itself can be mounted at eye level in front of the pilot on a swinging arm similar to those used in attaching sunshades in automobiles. Instruments using the swinging arm may be pushed above the windshield or to one side. In planes embodying it as standard equipment, the instrument will spring out of the instrument panel at the push of a button. (*Continued on page 99*)



Using Flint instrument, cross-country flyer flips toggle switch at Point A. Sighting through bead of light he sees that normal glide will not clear obstructions until he reaches Point B. If engine fails at A, device would show he must find alternate area.

Helicommuter

IT IS A popular pipe dream in aviation to visualize the use of the helicopter as a flying taxicab. A FLYING editor in Chicago recently had the opportunity to make the dream come true, if only for one brief trip. The photographs on this and the following two pages were taken on that trip.

The helicopter in these pictures was an Army Sikorsky which, in its civilian version, could carry three passengers behind the pilot. Whether this particular machine could operate a commuters' service profitably at reasonable fares is open to question. But from the standpoint of practicality, the average pushed-around commuter today doesn't know what he's missing. A commuters' helicopter line is quite possible.

FLYING's editor was picked up by the AAF helicopter in a clearing a few feet from his front door in Glenview, Ill. Sixteen minutes later he was standing on the roof of the Merchandise Mart in downtown Chicago. On a crawling interurban electric train, the same trip takes 45 minutes—if the train runs on time, which is rare. Pictures on the following pages show how the flight went.

You may be going down to the office in a helicopter instead of a train one of these days.

Over The Loop, editor's helicopter prepares to land on Mart roof.

Leaving home in Glenview, Editor Max Karant walks down road from house (farthest right) to meet helicopter. Picture was taken from plane as it settled onto clearing in foreground. Nearest rail station is two miles away, a winding 10-minute drive.

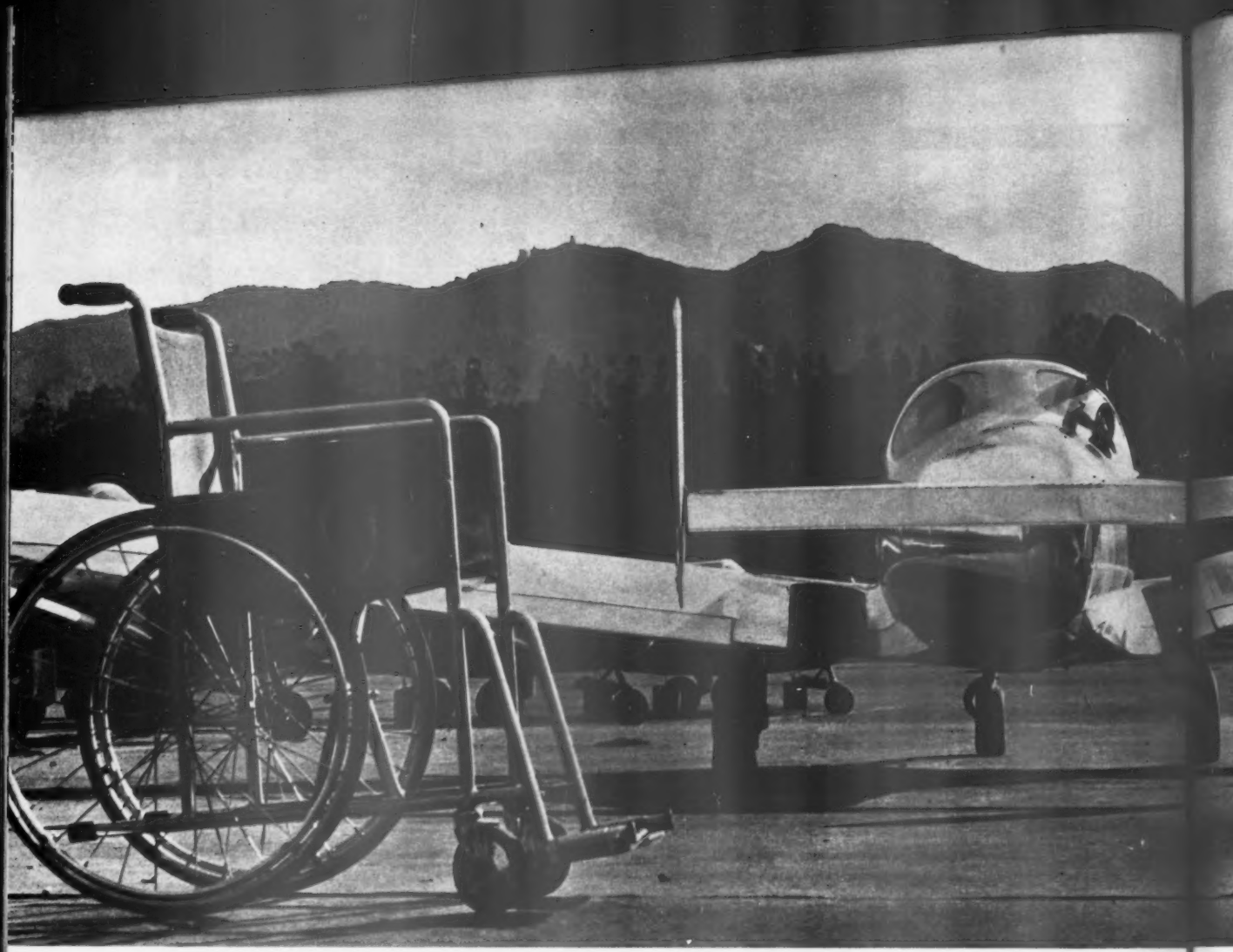
Awaiting its passenger, Sikorsky's rotor is stopped, its engine idling. The Karant dog tried to attack machine until rotor blast hit him.

Approaching Merchandise Mart, landing area (with white cross) can be seen. The strong winds around building's towers

Ready for take-off from Glenview clearing, pilot is about to engage engine to rotor. Service like this could be assured in all but zero-zero weather. Helicopters can operate in bad weather because of their ability to fly low and slow with safety.

made landing tricky. This landing spot also was used when Army helicopters flew experimental mail delivery in Chicago.

On Mart's roof, Karant leaves for office. While it took 16 minutes to make flight, getting from roof to cab to office took another 15 minutes.



Wheel chair left behind, a disabled vet gets final instruction before one of the flights that are changing his outlook on life.

Wheel-Chair Aces

UNABLE TO WALK, THESE VETS LEARN TO FLY INSTEAD

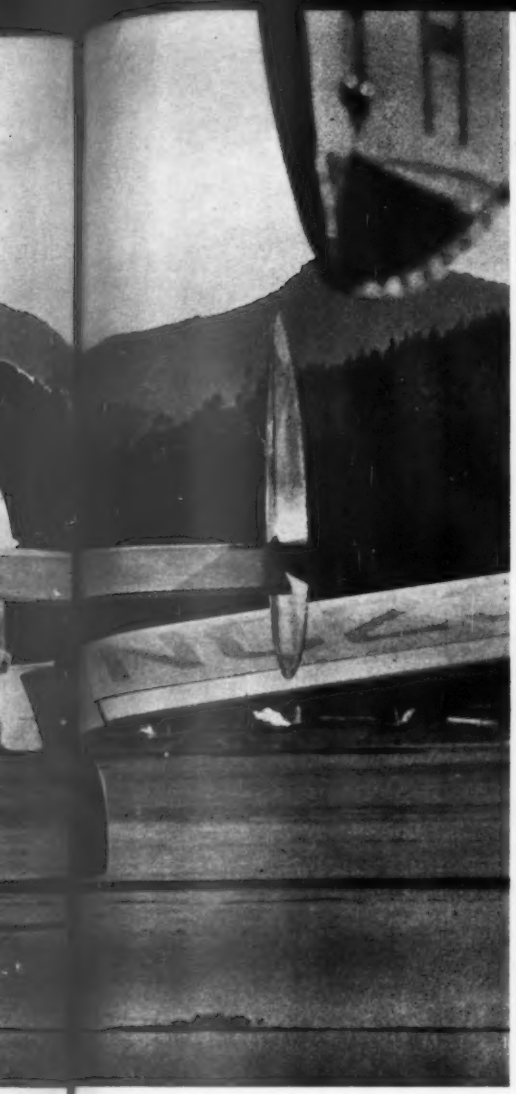
By RUS WALTON

DEAN LARSEN of Wales, Utah, cooked up the idea. He had lost the use of both his legs. That happened back in 1945 when he caught a .45-caliber slug in his spine during the drive on Germany. Army doctors listed him as a "paraplegic" (paralyzed from the waist down) and forecast a wheel-chair future. But Larsen had a different idea—one that already has given wings to a lot of wheel chairs.

Just as soon as he learned there would be no more walking, Larsen decided it was high time he learned to fly. He boned up on a plane he had heard about called the *Ercoupe*. He knew it had no rudder pedals and that all its controls could be operated by hand. It was only a year after he received his crippling injury that Larsen took off on his first solo flight. Long before that time he had worked out plans for forming Pilots' Veterans Club, No. 1. And he put that "No. 1" in the title simply because he intended the club to be only the first of many such groups at veterans' hospitals throughout the country.

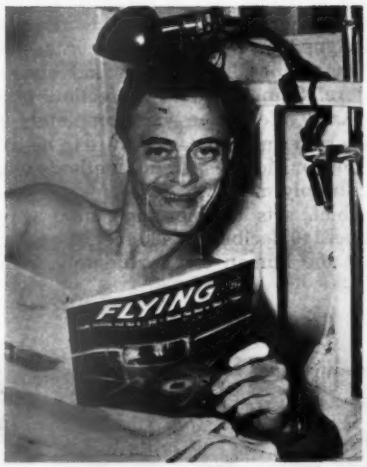
Doctors were quick to support the plan—it promised to do much for their rehabilitation programs. Only snag was that the Veterans Administration had no funds to purchase a plane. The vets themselves had no way of raising the money. But about that time Norman Nesbitt, a radio newscaster of Glendale, heard the story and started plugging it on his program. Contributions from organizations and individuals poured in to the tune of better than $4,500.

California distributors of *Er-* *(Continued on page 99)*



Ground briefing begins for (left to right) Charles Niles, Robert Laird and Edward Gordon. Instructor Roger Clarke is one of many who give free training.

"Plane owners" hear Norman Nesbitt (right) tell how radio fans raised funds to buy them an Ercoupe. Ground-school sessions (below) are held at hospital.



Organizer of first pilots' club for disabled vets, Dean Larsen hopes to start similar units throughout U. S.

FOG FACTORY

Skytrain lands on Arcata runways cleared by war-developed FIDO burners. Flame in foreground is a runway marker beacon.

By
GAITHER LITTRELL
West Coast Editor of FLYING

Researchers use fire, light and sound in attempt to control fog

OLD-TIMERS in aviation often call flying a "screwy business." But that is a gross understatement, considering what goes on every day of the year at a large airport at Arcata, near Eureka, Calif.

There pilots, ground crews and tower operators actually yearn for the worst weather the elements can brew. And then they go out and fly under conditions where even the seagulls are smart enough to stay on the ground.

Personnel at this airport—known as the Landing Aids Experimental Station, the only one of its kind in the world—are attempting to do something about the weather, not just talk about it. They are conducting the first large-scale research project on all-weather flying, trying to determine the best equipment to aid a plane to land and take off in fog, rain and snow.

Sponsoring the project are the Army, Navy, Civil Aeronautics Administration, Civil Aeronautics Board, Air Transport Association and the Air Line Pilots Association, with United Air Lines serving as the research contractor at the station. The combined program was set up to eliminate duplication of effort and to solve in the most economical way the weather problems affecting aircraft.

Many systems designed to defeat the elements—principally fog—and bring planes in safely in bad visibility have been tested there. Some are near perfection; others still only promising. Only a few have been completely discarded while others which smack of fantasy are to be tried.

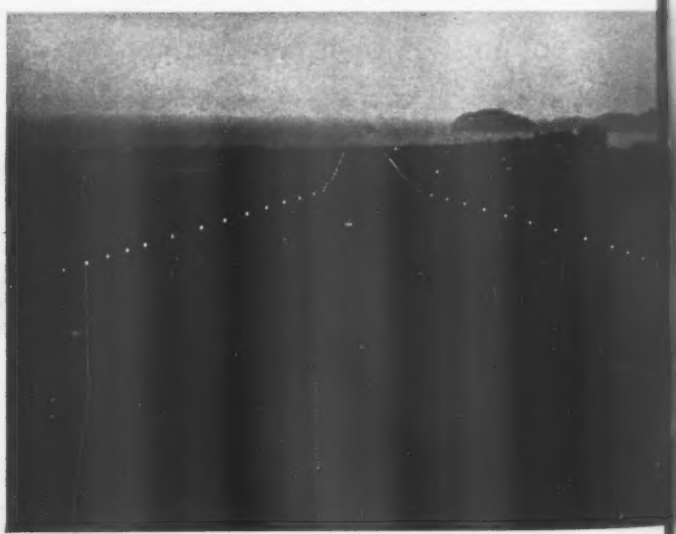
One of the most unusual fog-dispersing methods which has been tested—with only moderate results—uses ultrasonic equipment, which sets up piercing sound waves, developing as much as 140 decibels at 400 feet. The sound wave is so high that the human ear, fortunately, cannot

EX-NAVY STATION IS TEST CENTER

Foggiest U. S. airport is huge former Navy air station at Arcata, Calif. Heavy fogs roll up whenever warmed Pacific Ocean air crosses cool California coastal current. Runways are lined with many types of fog dispersal equipment which can be controlled by control tower operator (right).

Fog-fighting flames leap nearly eight feet in the air—so hot that they scorch the woolen shirt of the jeep driver driving 50 feet away. This type of fog dispersal equipment burns Diesel oil which is fed to jets under 1,750-pound pressure.

Ultra-sonic waves have proven moderately successful in clearing fog. This unit produces a whine too high-pitched to be heard by human ear.



Vari-colored approach lights mounted on towers of descending height converge on runway. Green lights outline the landing area.

hear it. However, a peculiar vibrational effect is set up which is said to have affected the nerves of some workers in the vicinity, making them ill for a few minutes.

Basic principle behind this idea is that the sound waves, created by mammoth sirens operated at 3,000 r.p.m., cause the fog particles to move in cycles. These moisture particles bump into each other when put into motion. In several tests, the jostling particles have become so large in only 40 seconds that they can no longer remain in suspension and drop to the ground like rain. Visibility is slightly increased.

Atomic energy also may be tried in the years to come, when more about such energy becomes known.

Also to be tested within a short time is solar energy. In this system, water would be heated by the sun in good weather; stored in underground (*Continued on page* 78)

REPORT FROM WASHINGTON

By FRED HAMLIN

LOOK for some really fancy personal aircraft at the 1947 shows, and perhaps even fancier ones in 1948. Lightplane manufacturers indicated a '47 trend toward plush four-placers at the Cleveland Air Show last fall, and many of these will be showing up alongside the putt-putts and the first robins at small fields, monopolizing the bottom of the "executive" market. There is also promise that manufacturers of the big transports, anticipating recession of the airline market by the end of this year, will come out with some fancy jobs designed to catch the eye of well-to-do business men and large corporations. Douglas, we hear, is already shooting at test flights on its "Project 1015"—a low-wing, all-metal, five-place plane that is expected to cruise around 200 m.p.h. with a normal range of 1,000 miles. It has an eight-foot tail propeller, somewhat similar in design to the XB-42 "Mixmaster." Power is supplied by two side-by-side Continentals in the fuselage behind the cabin. It has retractible landing gear, while the struts and oleos are short enough for a low step in an auto-like door. Price: about $20,000. Popular name: *Cloudster.*

Planeless Jet

The believe-it-or-nots coming out of the jet field are getting to be as numerous as the sands, but best we've heard recently comes from the west coast where one of our agents informs us is a wonder-jet engine—the Menasco ram model. It's supposed to be so simple to make contrasted with other ram jets that it could be turned out in carload lots almost overnight. A little while ago Menasco sent it on to Wright Field for testing—and from there on things got bizarre. Wright Field didn't have the facilities, either—had to build a special test stand. And believe it or not, there is no airplane in existence today in which the engine could be installed for aerial testing. Therefore, according to present plans, in order to get the engine flying an aircraft manufacturer will have to be given a contract to build a plane around the engine. Wright Field is tussling with the problem now. Best we can report otherwise is that all engineers who have studied it are as impressed with the engine as with its production possibilities and are determined to see it endowed with wings.

Airvets

Also from the west coast comes word of a new veteran's organization which has all the earmarks of being refreshingly different in its approach to the ex-soldier's post-war problems. It's called the Airvets Association of Greater Los Angeles and, among other things, brags that it is *not* interested in politics, pomp or "Saturday night dances and stag smokers." The quotes are from George Varga, 33, head of the outfit and holder of the DFC, Air Medal and honorable discharges from both the Royal Canadian Air Force and the AAF. Affirmative goal of the Airvets: jobs for members. When last heard from, they were doing all right, too. They have an airport at Bellflower, Calif., and before they (*Continued on page* 102)

New Douglas Cloudster has two Continental engines buried in fuselage driving tail prop. It carries a pilot and four passengers, plus 250 lbs. of baggage. At this maximum load, range is 950 miles at 200 m.p.h. Tricycle gear retracts.

U.S. Service Aircraft

Army Designation	Navy Designation	Popular Name	Manufacturer	Typical Engines	Thrust or H.P. At T.O. Each Engine	Span	Length	Gross Weight (Lbs.)	Empty Weight (Lbs.)	Max. M.P.H.	Range Miles	Service Ceiling (Feet)	Remarks
BOMBERS													
B-17G	PB-1	Flying Fortress	Boeing	4 Wright R-1820-97	1,200	103′9″	74′9″	65,000	36,000	303	3,300	35,000+	Coast Guard uses PB-1.
B-24J	.....	Liberator	Convair	4 P&W R-1830	1,200	110′	67′4″	66,231	36,294	294	3,290	32,000	Also used as AT-22.
B-25J	PBJ-1J	Mitchell	North American	2 Wright R-2600	1,700	67′7″	53′6″	36,514	19,628	300	2,650	25,500	Called AT-24A, TB-25.
B-29B	.....	Superfortress	Boeing	4 Wright R-3350	2,200	141′3″	99′	135,000	108,000	370	4,000+	35,000	10-ton bomb load.
B-32C	.....	Dominator	Convair	4 Wright R-3350	2,200	135′	83′1″	119,895	60,272	358	4,421	32,600	10-ton bomb load.
B-34	PV-1	Ventura	Lockheed	2 P&W R-2800-25BG	2,000	65′6″	51′9″	26,500	19,335	316	1,210	29,000	Also used as O-56.
XB-35	XB2T-1	Flying Wing	Northrop	4 P&W R-4360	3,000	172′	53′	162,000	90,000	400+	10,000	35,000	Crew 15.
XB-36	.....	.....	Convair	6 P&W R-4360	3,000	230′	163′	265,000	127,643	....	10,000+	30,000	36-ton bomb load.
B-37	PV-2	Harpoon	Lockheed	2 P&W R-2800-25BG	2,000	75′	51′9½″	33,000	21,623	301	2,090	27,000	5,000 lb. bombs.
.....	P2V-1	Neptune	Lockheed	2 Wright R-3350-8	2,300	100′	75′6″	58,000	32,854	296	4,950	29,200	6 50-cal., 16 rockets.
.....	PBM-5	Mariner	Glenn L. Martin	2 P&W R-2800	2,100	118′	80′	56,000	32,328	200+	2,485	20,200	PBM-5A is amphibian.
OA-10A	PBY-6A	Catalina	Convair	2 P&W R-1830	1,200	104′	63′11″	38,525	20,709	189	2,450	19,200	Crew 9.
OA-10	PB2B-2	Catalina	Boeing-Canada	2 P&W R-1830	1,200	104′	64′8″	34,000	18,000	196	3,000+	16,000	N.A.F. version, PBN-1.
.....	PB2Y-5	Coronado	Convair	4 P&W R-1830	1,200	115′	79′3″	72,500	39,662	217	3,250	20,800	Crew 10.
.....	PB4Y-2	Privateer	Convair	4 P&W R-1830	1,350	110′	74′7″	67,144	37,765	245	3,964	21,200	Similar to B-24J.
A-20K	BD-2	Havoc	Douglas	2 Wright R-2600	1,700	61′4″	48′6½″	26,194	17,607	325	2,510	22,700	Also used as P-70.
A-24B	SBD-6	Dauntless	Douglas	Wright R-1820	1,200	41′6″	33′	9,298	6,345	253	1,000+	25,525	Crew 2.
A-25C	SB2C-5	Helldiver	Curtiss-Wright	Wright R-2600	1,900	49′9″	36′8″	15,536	10,738	294	1,514	23,950	Called SBW-5,SBF-5[1].
A-26B	JD-1	Invader	Douglas	2 P&W R-2800	2,000	70′	50′8″	32,086	22,300	370	1,658	24,000	16 50-cal. guns.
.....	TBF-3	Avenger	Grumman	Wright R-2600	1,700	54′2″	40′	15,536	10,443	278	2,470	22,600	Same as TBM-3[2].
.....	AM-1	Mauler	Glenn L. Martin	P&W R-4360	3,000	50′1″	41′6″	21,000	14,190	350+	1,700	25,000	2 tons of bombs.
.....	AD-1	Skyraider	Douglas	Wright R-3350	2,500	50′	39′	15,600	10,470	325+	1,900	25,000+	Fuselage dive brakes.
B-50	.....	Superfortress	Boeing	4 P&W R-4360	3,500	141′2.76″	99′	120,000	.....	.....	.....	.....	Revised B-29.
FIGHTERS													
P-38L	.....	Lightning	Lockheed	2 Allison V-1710-F30	1,475	52′	37′10″	16,255	13,600	415	3,600[7]	43,000	3,200 lbs. of bombs.
P-39Q	.....	Airacobra	Bell	Allison V-1710-85	1,200	34′	30′2″	8,074	5,645.6	380	1,380	35,000	37-mm. cannon.
P-47N	.....	Thunderbolt	Republic	P&W R-2800	2,800	42′6½″	36′1″	13,954	11,109	467	3,400	40,000	½-ton bombs.
P-51H	.....	Mustang	North American	Packard V-1650 Merlin	1,600	37′	33′4″	8,452	6,537	495	2,000+	42,000	½-ton bombs.
P-59B	(XF2L-1)	Airacomet	Bell	2 G.E. J-31 (I-16)	1,675	45′6″	38′2″	11,019	8,140	446	780	43,400	Turbo-jet engines.
P-61C	FT-1	Black Widow	Northrop	2 P&W R-2800	2,000	66′	48′8″	28,217	22,000	370	3,000	30,000	Night fighter.
P-63A	.....	Kingcobra	Bell	Allison V-1710-93	1,325	38′4″	32′10″	8,442.5	6,693.7	423	1,109	40,200	37-mm. cannon.
RP-63G	.....	.....	Bell	Allison V-1710-135	1,200	39′2″	32′10″	10,532	9,443.6	320	480	20,000	Target plane.
P-70B	BD-2	Havoc	Douglas	2 Wright R-2600	1,700	61′4″	47′7″	21,264	16,031	338	1,460	28,000+	Night fighter, bomber.
P-80A	.....	Shooting Star	Lockheed	G.E. J-33 (IEI-40)	4,200	38′10½″	34′6″	14,495	7,920	560+	2,500	45,000+	6 50-cal. guns.
XP-81	.....	.....	Convair	T.G. 100 and I-40	.....	50′6″	44′8″	19,500	500+	.....	.....	.....	Turbine and Jet.
P-82E	.....	Twin Mustang	North American	2 Allison V-1710	2,300	51′3″	38′3″	21,039	15,303	486	1,965	45,000	2-ton bomb load.
P-84	.....	Thunderjet	Republic	G.E. J-35 (TG-180)	4,000	36′5″	37′2½″	13,400	.....	590	1,000	40,000+	Jet turbine engine.
.....	F6F-5	Hellcat	Grumman	P&W R-2800-10W	2,000	42′10″	33′6″	12,598	9,060	410	1,900	38,800	2 20mm. cannon.
XP-65	F7F-3	Tigercat	Grumman	2 P&W R-2800	2,100	51′6″	45′5″	21,738	16,592	450	1,900	40,400	2-ton bomb load.
.....	F8F-1	Bearcat	Grumman	P&W R-2800	2,100	35′6″	28′3″	9,430	7,170	455	2,200	40,800	1-ton bomb load.
.....	F8B-1	.....	Boeing	P&W R-4360	3,600	54′	43′3″	17,000	.....	514	2,000	35,000	13½-ft. contraprops.
.....	F4U-4	Corsair	Chance Vought	P&W R-2800-C	2,100	41′	33′4″	11,500	9,014	450+	1,500+	35,000+	Also FG-4, F3A-1[3].
.....	F2G-2	Corsair	Goodyear	P&W R-4360	3,500	41′	33′10″	14,000	11,500	450	2,500	16,500	Climb 7,000 f.p.m.
.....	FD-1	Phantom	McDonnell	2 X19XB-2B[8]	.....	40′9.3″	38′9.5″	9,799	6,437	500+	1,000+	.....	Turbo-jet engines.
XP-73	FR-1	Fireball	Ryan	G.E. J-31, Wright R-1820	3,025	40′	32′1″	9,862	7,736	426+	1,500	35,000	Jet, radial engines.
.....	FM-2	Wildcat	Eastern	Wright R-1820	1,350	38′	28′11″	7,500	5,765	320+	1,000+	28,000	Also called F4F-8[4].
.....	XF2R-1	.....	Ryan	TG-100 prop-jet&I-16	.....	.....	36′	.....	.....	500[9]	.....	.....	Turbine plus jet.
TRANSPORT AND CARGO													
UC-43H	GB-2	G-175	Beech	P&W R-985	450	32′	26′9½″	4,250	2,800	212	1,000	20,000	5-place transport.
UC-45F	JRB-4	Expeditor	Beech	2 P&W R-985	450	47′7″	34′	7,850	5,830	217	876	22,500	7-place transport.
C-46E	R5C-2	Commando	Curtiss-Wright	2 P&W R-2800	2,000	108′1″	76′4″	50,000	30,456	264	1,600+	25,000+	15,000-lb. load.
C-47B	R4D-7	Skytrain	Douglas	2 P&W R-1830	1,200	95′	63′9″	29,000	18,133	230	1,750	24,300	Military DC-3.
C-53D	R4D-4	Skytrooper	Douglas	2 P&W R-1830-92	1,200	95′	63′9″	29,000	17,151	228	2,070	24,100	Troop carrier.
C-54G	R5D-5	Skymaster	Douglas	4 P&W R-2000	1,450	117′6″	93′5″	73,000	38,931	270+	3,000+	26,500	Military DC-4.
C-60A	R5O-6	Lodestar	Lockheed	2 Wright R-1820-87	1,200	65′6″	49′9⅓″	18,500	12,520	265	1,660	26,200	Personnel transport.
UC-61K	GK-1	Forwarder	Fairchild	Ranger 6-440C-5	200	36′4″	25′10″	2,882	1,813	124	555	11,400	Cargo-personnel.
C-64B	JA-1	Norseman	Noorduyn	P&W R-1340	600	51′8″	32′4″	6,450	3,816	169	600	17,000	8-place transport.
C-69	.....	Constellation	Lockheed	4 Wright R-3350-35	2,200	123′	95′2.04″	86,250	48,665	350+	3,500	23,600	100 troops.
UC-70	GH-3	Nightingale	Howard	P&W R-985	450	38′	25′8″	4,350	3,050	201	920	21,500	Also Navy NH-1.
UC-78	JRC-1	Bobcat	Cessna	2 Jacobs R-755	225	41′11″	32′9″	5,700	4,054	175	648	15,000	Also AAF AT-17.
C-74	.....	.....	Douglas	4 P&W R-4360	3,000	173′3″	124′2″	145,000	83,483	315	.....	23,200	125 passengers.
C-82A	.....	Packet	Fairchild	2 P&W R-2800	2,100	106′5″	77′1″	50,000	28,000	244	4,300	25,000	6-ton cargo.
C-87C	RY-3	Liberator Exp.	Convair	4 P&W R-1830	1,350	110′	75′5″	60,000	32,287	306	3,550	31,000	Converted B-24.
XC-97	.....	Stratocruiser	Boeing	4 Wright R-3350	2,200	141′3″	110′4″	135,000	70,000	400	3,500	30,000	Offshoot of B-29.
OA-12	J2F-5	Duck	Grumman	Wright R-1820	900	39′	35′1″	7,100	5,200	176	790	21,000	Amphibian.

WELL over 300 clearly-definable aircraft designs were used by the AAF, Navy, Coast Guard and Marines during the war. Several score models have been announced since. Many of the planes used during the war are no longer in service, however, and of the new models announced, most consist of only one to three, or at most a handful of experimental aircraft. This table is designed to present for the most part only those models still in service or about to be put into service in appreciable numbers. Experimental designs not intended for general service, and planes which have been taken out of service have, generally, been eliminated. The information contained here is believed to be the most complete and up-to-date releasable at present.

Army Designation	Navy Designation	Popular Name	Manufacturer	Typical Engines	Thrust or H.P. At T.O. Each Engine	Span	Length	Gross Weight (Lbs.)	Empty Weight (Lbs.)	Max. M.P.H.	Range Miles	Service Ceiling (Feet)	Remarks
.....	J2F-6	Duck	Commonwealth-Columbia	Wright R-1820	1,050	39′	34′	7,700	5,710	190	850	22,000	Grumman design.
OA-14	J4F-2	Widgeon	Grumman	2 Ranger 6-440	200	40′	31′1″	4,500	3,170	175	780	15,500	2-engined amphibian.
.....	JRM-1	Mars	Glenn L. Martin	4 Wright R-3350-8	2,100	200′	120′3″	145,000	78,000	222	5,800	16,430	Flying boat.
OA-9	JRF-15	Grey Goose	Grumman	2 P&W R-985	450	49′	38′4″	8,500+	5,878	189	1,050	22,000	Amphibian.
.....	AE-1	Grasshopper	Piper	Lycoming O-235	100	35′3″	22′3″	1,550	906	110	264	15,000	Ambulance plane.
						TRAINERS							
AT-6D	SNJ-6	Texan	North American	P&W R-1340	600	42′	29′	5,237	4,095	205	1,000	22,000	All-metal trainer.
AT-7C	SNB-2	Navigator	Beech	2 P&W R-985	450	47′7″	34′	7,850	5,927	217	876	22,500	Navigation trainer.
AT-10	.....	Wichita	Beech	2 Lycoming R-680	295	44′4″	32′2″	6,000	4,827	198	770	16,900	Plywood-metal.
AT-11	SNB-1	Kansan	Beech	2 P&W R-985	450	47′7″	34′1″	8,727+	5,935	215	870	20,000	Bombardier trainer
BT-13A	SNV-2	Valiant	Vultee (Convair)	P&W R-985	450	42′	28′10″	4,408	3,465	182	550	18,500	Basic trainer.
PT-13D	N2S-5	Kaydet	Boeing (Wichita)	Lycoming R-680	225	32′2″	25′	2,786	2,098	119	400	10,000	(5)
PT-17A	N2S-4	Kaydet	Boeing (Wichita)	Continental R-670	220	32′2″	24′10″	2,700	1,919	123	385	13,200	(5)
PT-18	.....	Kaydet	Boeing (Wichita)	Jacobs R-755	225	32′2″	24′10″	2,717	1,936	125	463	14,200	(5)
PT-19A	.....	Cornell	Fairchild	Ranger 6-440C-2	175	36′	27′	2,518	1,851	126	430	13,000	Plywood trainer.
PT-22A	NR-1	Recruit	Ryan	Kinner R-55	160	30′1″	22′5″	1,860	1,308	128	325	14,800	Metal fuselage.
PT-23	.....	Cornell	Fairchild	Continental R-670	220	36′	25′11″	2,747	2,046	131	370	13,250	More h.p. PT-19A
PT-26	.....	Cornell	Fairchild	Ranger L-440-7	200	36′11″	27′8″	2,702	2,001	130	396	17,000	Blind flying equip.
						PHOTO PLANES							
F-5B	.....	Lightning	Lockheed	2 Allison V-1710-F17	1,425	52′	37′10″	17,552	12,990	415	3,600+	45,000	Converted P-38.
F-6D	.....	Mustang	North American	Packard V-1650	1,600	37′5″	32′4″	8,452	6,537	450	2,000	45,000	Converted P-51.
F-7	PB4Y-1P	Liberator	Convair	4 P&W R-1830	1,200	110′	66′4″	60,000	36,200	317	3,200	32,000	Converted B-24.
F-8	.....	Mosquito	De Havilland	2 Packard PM225	1,650	54′2″	40′9½″	22,650	14,950	400	1,350	30,000	British plane.
F-9	PB-1P	Flying Fortress	Boeing	4 Wright R-1820	1,200	103′9″	74′9″	60,000	31,000	303	3,300	35,000+	Converted B-17.
F-10	PBJ-1P	Mitchell	North American	2 Wright R-2600	1,700	67′6″	53′5″	36,514	19,628	300	2,650	30,000	Converted B-25.
XF-11A	.....	.....	Hughes	2 P&W R-4360	3,250	101′	.....	36,000	.....	450	6,000	50,000	Three built.
XF-12	.....	Rainbow	Republic	4 P&W R-4360	3,250	129′2″	98′9″	16,500	68,024	450+	4,400	41,000	Also transport.
F-13A	.....	Superfortress	Boeing	4 Wright R-3350	2,200	141′3″	99′	135,000	108,000	370	4,000+	35,000+	Converted B-29.
F-14	.....	Shooting Star	Lockheed	1 G.E. J-33 (7EI-40)	4,200	39′10½″	34′6″	14,495	7,920	580+	2,500	45,000+	Also FP-80A.
F-15	.....	Reporter	Northrop	2 P&W R-2800	2,200	68′	50′6″	32,000	23,800	440	4000+	39,000	Seven cameras.
						LIAISON AND OBSERVATION							
L-4J	NE-1	Grasshopper	Piper	Continental A-65	65	35′2″	22′5″	1,220	740	90	206	11,500	Was O-59A.
L-5G	OY-1	Sentinel	Convair	Lycoming O-435	185	34′	24′1″	2,090	1,517	129	257	15,300	Was O-62.
.....	OSE-1	.....	Fairchild	Ranger SGV-770C-2 and V-770-8	550	.....	.....	.....	.....	.....	.....	.....	.....
.....	OS2U-3	Kingfisher	Chance Vought	P&W R-985	450	35′10 11/16″	33′10″	4,980	3,335	160+	1,000+	11,000	Also OS2N-1.
.....	SC-2	Seahawk	Curtiss-Wright	Wright R-1820	1,425	41′	36′4″	7,881	6,561	301	655	34,000	Land or seaplane.
						GLIDERS AND HELICOPTERS							
CG-3A	.....	.....	Waco	.....	.....	73′1″	48′6″	4,400	2,044	120	.....	.....	Blind flying equip.
CG-4A	LRW-1	Hadrian	Waco	.....	.....	83′8″	48′4″	7,500	4,073	150	.....	.....	6 men or jeep.
CG-13A	.....	.....	Waco	.....	.....	85′7″	54′3″	18,900	8,700	209	.....	.....	40 troops.
CG-15A	.....	.....	Waco	.....	.....	62′2″	48′10″	8,000	4,069	180	.....	.....	14 troops.
.....	XHJD-1	Helicopter	McDonnell	2 P&W	450	87′	46′	11,000	.....	.....	.....	.....	Twin-engined.
R-4B	HNS-1	Helicopter	Sikorsky	Warner R-550	180	.....	31′6″	2,530	2,011	82	100	8,000	Rotor 38′ dia.
R-5A	HO2S-1	Helicopter	Sikorsky	P&W R-985	450	.....	40′10″	4,900	3,275	114	360	21,000	Rotor 48′ dia.
R-6A	HOS-1	Helicopter	Sikorsky	Franklin 6ACV-403	245	.....	47′11″	2,600	2,016	100	450	15,000	Rotor 38′ dia.
.....	S-51	Helicopter	Sikorsky	P&W R-985	450	.....	47′½″	4,900	3,650	115	245	13,000	Carries 4.
						DRONES AND TARGET PLANES							
OQ-2A	TDD-1	Target Plane	Radioplane Co.	Righter Twin Cylinder	6	12′	9′	112	100	88	.....	8,000	Radio controlled.
OQ-3	TDD-2	Target Drone	Radioplane Co.	Righter Twin Cylinder	8	12′	9′2″	105	90	103	.....	10,000	Radio controlled.
OQ-14	TDD-3	Target Drone	Radioplane Co.	Righter Twin Cylinder	22	12′	9′1″	130	114	141	.....	16,000	Heavier tail.
OQ-19	KD2R-1	Target Drone	Radioplane Co.	McCulloch Four Cyl.	65	11′5″	12′3″	300	270	250	.....	25,000	Metal fuselage.
PQ-8	TDC-1	.....	Culver	Franklin YO-200-1	90	26′11″	17′8″	1,305	860	145	300	18,200	Fixed gear.
PQ-8A	TDC-2	.....	Culver	Lycoming O-290	125	26′11″	18′3¼″	1,321	980	130	348	16,300	Radio controlled[6].
YPQ-12A	.....	.....	Fleetwings	Lycoming	185	30′¾″	20′1¼″	3,088	.....	185	.....	.....	Robot bomber.
PQ-14	TD2C-1	.....	Culver	Franklin ACT-298-J5	150	30′	19′5¾″	1,632	1,461	180	594	18,000	2,000 built.

1. Canadian Car and Foundry versions called SBW-5; Fairchild version called SBF-5.
2. TBM-3 built by General Motors.
3. Goodyear version called FG-4, Brewster version called F3A-1.
4. Grumman-built model called F4F-8.
5. Commonly called "Stearman" after the original manufacturer, this biplane trainer has open cockpit and is fabric covered.
6. Can be flown by pilot or radio-controlled.
7. Ferry range.
8. Made by Westinghouse.
9. "In 500 m.p.h. class."

Lumberman's Airport

Lumberman's Cub takes off from Southeast Portland Lumber Co.'s airport. Mill's stack in background serves as beacon and windsock.

The "Flying Dwyers"—(left to right) President Ed, Secretary Rosemary and Vice-president Tony of Southeast Portland Lumber Company—pose with Flight Instructor C. V. Hannah.

Their first flight saved the Dwyers thousands of dollars and gave the lumber company they operate a permanent set of wings.

By LEVERETT G. RICHARDS

THE "Flying Dwyers" took to the airplane because it solved their lumber business transportation problem—and now they find that they have stirred up a legislative battle in Portland, Ore.

The Dwyer story really starts over 23 years ago when the present lumbermen's father, Anthony J. Dwyer, opened his sawmill on the outskirts of Portland. Then logs were hauled 25 miles to the mill from the woods. That's a long trip for a sawmill executive to cover in managing his business. For a time, transportation by automobile was good enough.

But the business grew, Portland expanded and the cutting grounds became farther and farther away. Now the Dwyer mill is well inside the city's building limits and logs must be hauled at least 45 miles from the cutting grounds. And a lumber business can't be run properly from a plush office at the mill.

For years the Dwyers made the hour-and-a-half automobile trip to the timber country from the mill office. In summer the roads were coated with a heavy dust carpet and in winter they were churned to a gumbo of mud.

Then Airport Operator Henry Troh introduced the family to the airplane. A. J. Dwyer, Jr., made a hop and 27 minutes after taking off was gazing down at the cutting operations.

"That first trip saved us thousands of dollars," A. J. recalls, "Sitting up there where I could see the country in one glance, I could see at once that we were heading our

cutting operations in the wrong direction. We were cutting toward timber that was not yet ripe for the saw—heading in the opposite direction from the right one. It would have taken our timber cruisers and engineers months to find out the mistake and we would have wasted timber and cut needless roads. . . . Needless to say, it was that first lightplane flight which changed our entire plan of operation."

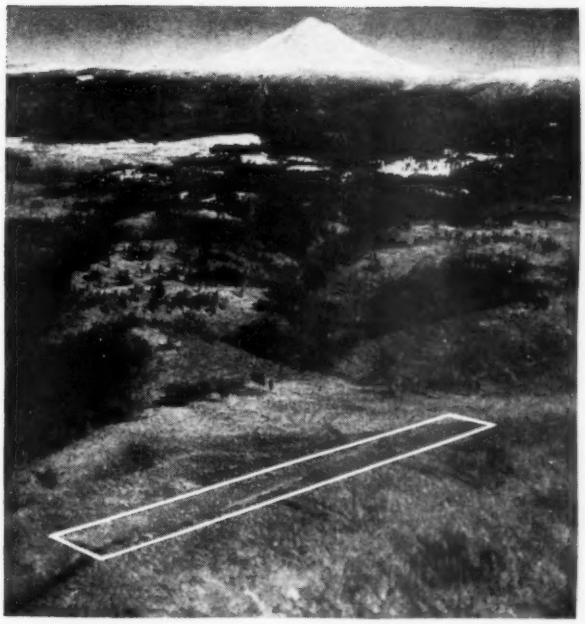
As a result of the flight, the Dwyers became airplane owners and the three brothers, Bob, A. J., Jr., and Ed, with their sister Rosemary enrolled for pilot training.

A bog alongside the mill was drained and sodded to make a 1,600-foot strip at the back door of their office at a cost of $15,000. Other private flyers noticed the Dwyers' activities and asked if they, too, could use the sawmill's airport. The location was ideal—it was the only landing place in the city from where pilots could commute to their planes by regular city bus transportation.

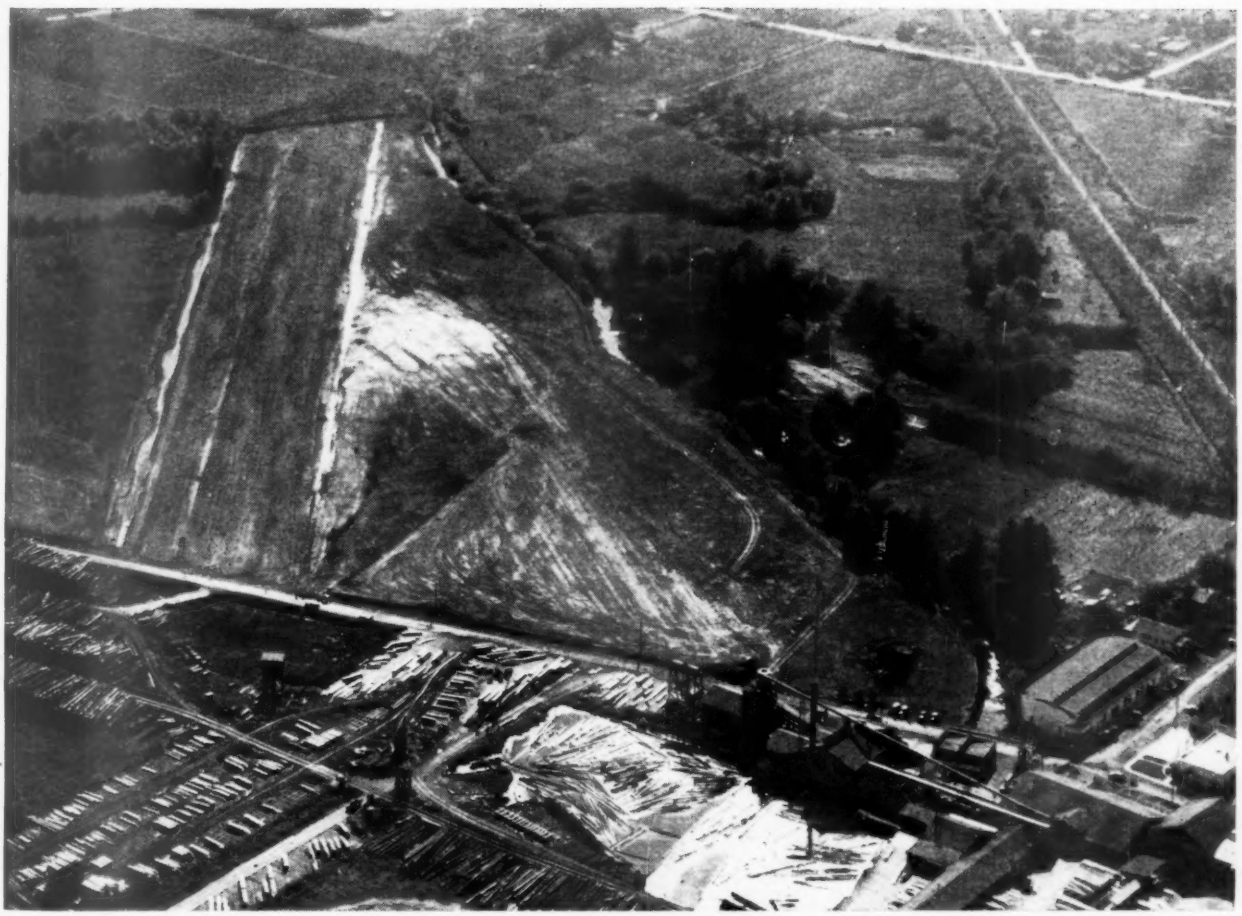
Why not? thought the Dwyers. So they made plans for a few hangars, a gas pump and maybe a repair shop. They could go into the airport business as a second industry if they wished.

Then, trouble. Four large property owners living within 1,000 feet of the airport protested to the city council against the "noise and hazard" of airplanes flying over houses.

The council had no ready answer since there was no ordinance on the city books that even mentioned the word "airplane." As a result, the city (*Continued on page* 86)



Timberland strip now being built will speed air management of the Dwyer lumber interests. Mt. Hood is in the background.

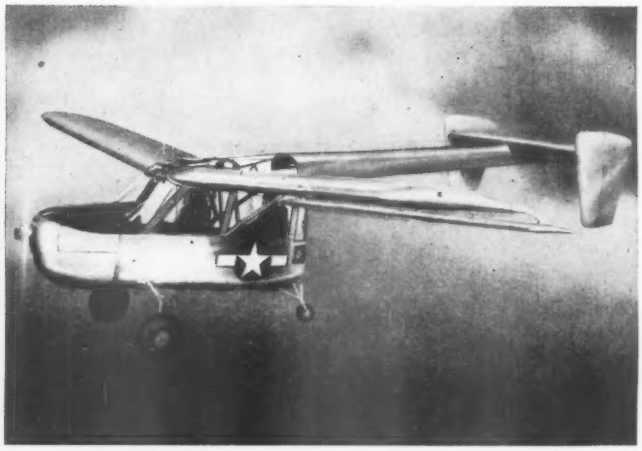


Airport development at the Southeast Portland plant caused minor legal squabble with neighboring property owners. Completed port will be limited in status by zoning restrictions. Charter operations, rentals and student instruction will not be permitted.

HAVE YOU SEEN?

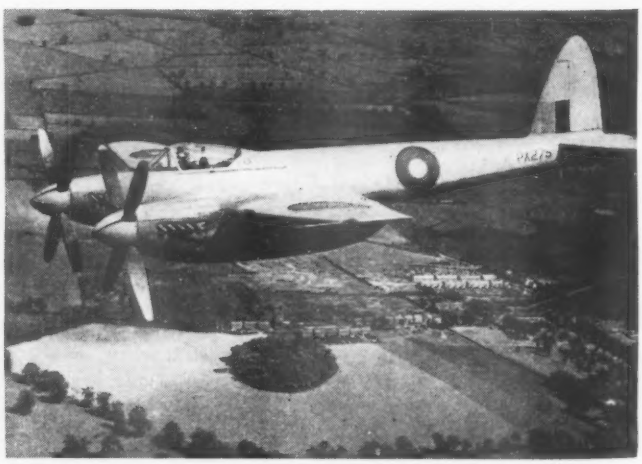
Douglas DC-6 is larger than DC-4, cruises at 316 m.p.h. Many will go to airlines, one to White House.

Electric compass rose at Piper plant works so well that two more are being installed. It can take as many as 60 planes per day.

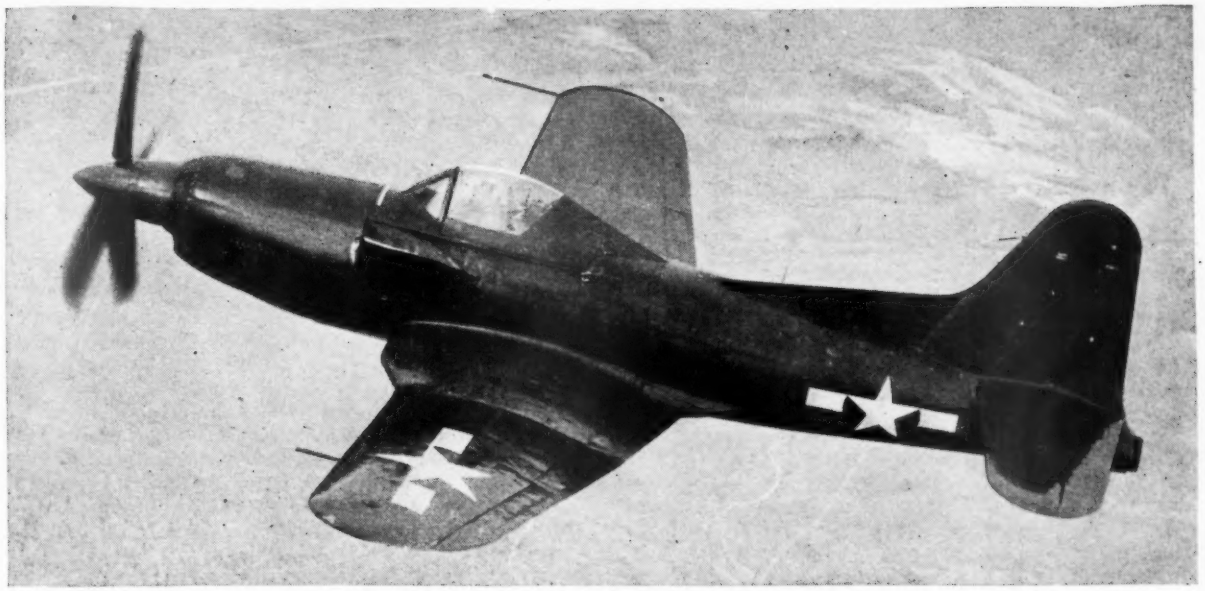


Boeing L-15A, new AAF liaison plane, has 125-h.p. engine, can carry two. Top speed is 112 m.p.h., stalling is 32. Span is 40 feet.

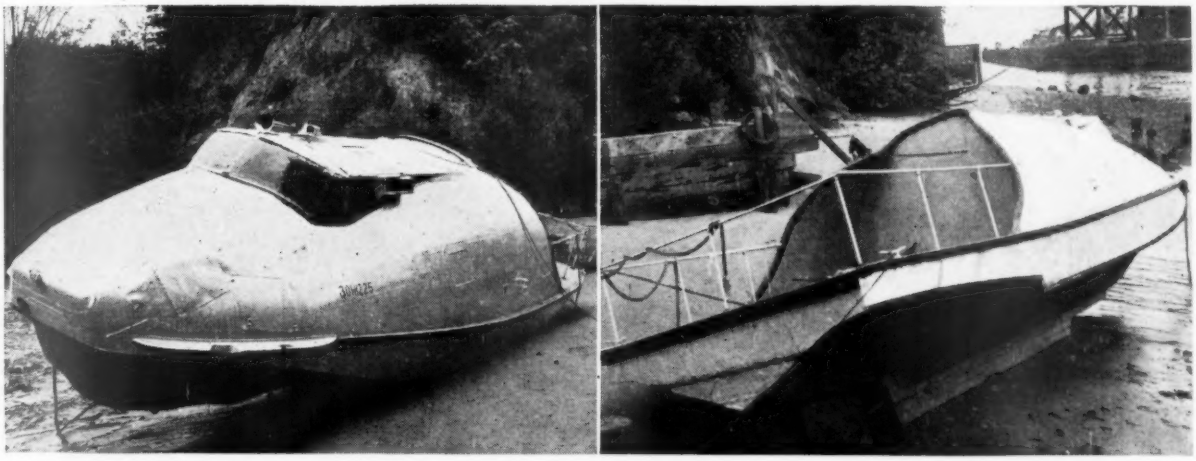
Airfoil on auto enables U.S. Rubber Co. test drivers to make high speed turns safely. Wing equalizes centrifugal pull in turns.



Gliding RAF Hornet makes a striking picture. Pilot feathered both engines for camera, restarted them after photograph was made.

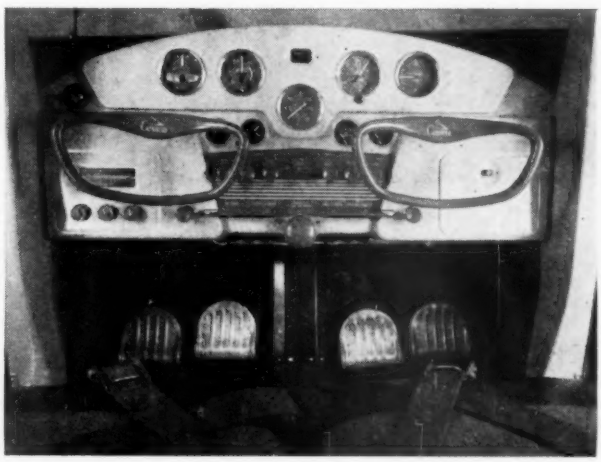


New Ryan fighter for Navy (XF2R-1) has gas turbine in nose, jet in tail. Span is 40 feet, speed is "in the 500-m.p.h. class."



Old Catalina hull was converted to motor launch at Seattle. Front view (left) shows how gunner's and bombardier's positions were sealed. Boat is steered from inside cockpit. Rear view shows open after deck. Engine is in hull ahead of the rudder.

Skycraft 447 is experimental four-place plane with 190 h.p. It cruises at 142, range is 715 miles. Standard price will be $6,700.



Cessna 140 for 1947 has this new cockpit with improved soundproofing and ventilation. Panel and controls have been modernized.

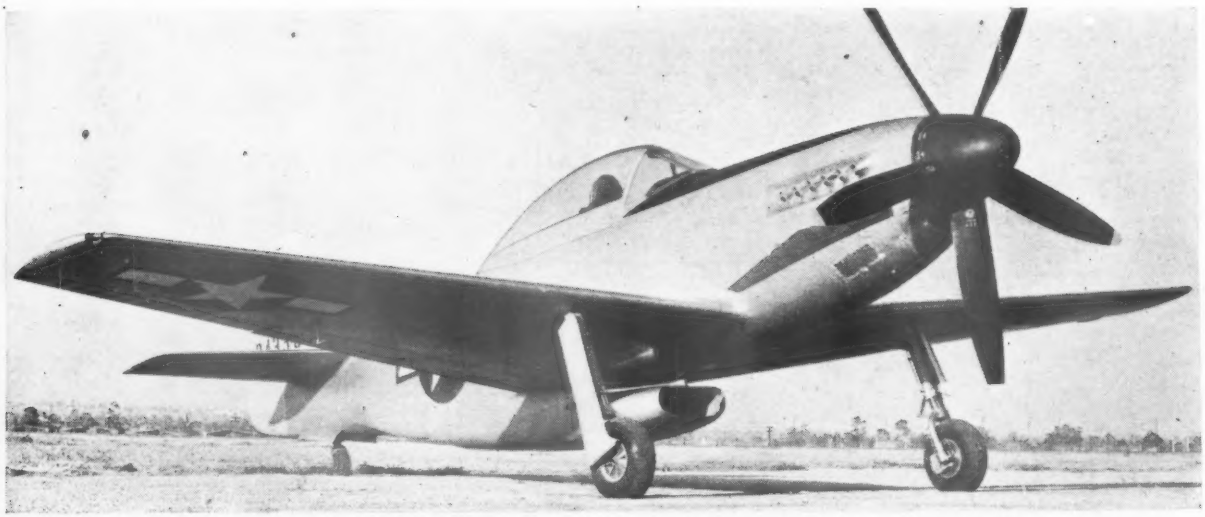
HAVE YOU SEEN?

(Continued)

Curtiss XF15C-1 was an experimental Navy fighter with piston engine in nose, jet in tail. Span was 48 feet, cruising speed 160. Project was later cancelled.

Martin 202 now is being tested, will go to several airlines. It has two 2,100-h.p. engines, will carry 40 passengers. It cruises at 263 m.p.h.

Russian rocket experiments apparently are being made with standard fighters like this with unit in tail.



This hotter Mustang (XP-51G) has 1,665-h.p. Rolls Royce engine, five-bladed British wood prop. Top speed is 495 m.p.h., service ceiling 46,000 feet. Gross weight is 7,265 pounds, 750 pounds lighter than standard P-51D. It will not be mass-produced.

LONDON LETTER

By Maj. OLIVER STEWART

British Authority, Editor of Aeronautics

OPINION about the value of air shows, and what shows might be worth supporting in the future, has been influenced by more complete reports that have come in on the 17th Paris International Aero Exhibition and on the Cleveland National Show, both of which were held last November.

In Paris the British effort was large and costly. But the show was a huge popular success, with well over half a million paying visitors. Not only were useful business contacts made but there was also a certain amount of direct selling. Among the British aircraft companies reporting aircraft sales in the Grand Palais were Miles and Percival, the latter's orders exceeding £500,000 ($2,000,000).

But the object of British constructors in going to Paris was not so much direct business as general propaganda in favor of British aircraft, engines and accessories. That object was achieved. American builders, although they took much less space than British, had some pleasing stands. The Curtiss Wright working sample of a constant speed propeller attracted favorable comment from the highly-critical French.

But I would say that the American effort ought to have been greater. French people, who expected tremendous things from the American aircraft constructors, were disappointed.

The summing up in London is that the British effort was worthwhile and that another similar effort ought to be made in the next Paris Show in 1948. Paris is a magnet which draws people from all parts of the world and no city is better suited to an international aero show.

Continental Design Trends

Another matter that has fallen into true perspective since the Paris Show is the state of aircraft design on the continent. France is still full of ideas, although she has fallen behind in execution. Her jet and rocket aircraft tend to be visionary rather than practical.

In personal flying, however, something is happening on the continent which Britain will have to watch closely.

The score of practical, well-tried, good-looking and comparatively cheap personal aircraft, from single-seaters to five-seaters, shown in Paris, have no parallel in Britain. The French machines show originality in conception and sound aerodynamic design.

Some of them are twin-boom pushers, like the *Courlis* and the Aero-center *Fregate;* some are tailless like the SE-2100; some are conventional low wing monoplanes, like the *Norécrin,* the *Noralpha* and the Morane-Saulnier, and some are specially-designed for cheapness like the little *Lévrier* two-seat biplane, which sells at £520 ($2,080), and the 40-h.p., S-50 mid-wing monoplane.

If the big French companies get into their production stride with these small machines, they will stand a good chance of taking and holding the entire continental market for personal aircraft for a long time to come.

Safety Committees

Humorists could not resist seizing their opportunity when Britain's Air Ministry announced the formation of a new committee with the extra- (*Continued on page* 101)

FRENCH AIR SHOW

While British planes dominated military aspects of the 17th Paris International Aero Exhibition, the French displayed a score of interesting personal aircraft of from one to five places. "The French planes show originality in conception and sound aerodynamics," says Major Stewart.

I Learned About Flying From That! NO. 88

Author and his Taylorcraft are shown just after lucky conclusion of Panama flight.

By LEROY POWELL

An amateur explorer finds overcast more perilous than the jungle below

IT WAS February, 1941, during the dry season in Panama—which isn't always too dry—that a friend and I got the yen to see what the country looked like from the ground. As amateur explorers, we couldn't have asked for better territory since much of the Panama jungle never has been touched by a white man. We selected Darien country east-northeast of Panama City for our tour.

We had decided that a general survey of the country from the air would be a good first step, to give us a general picture of the layout of land, mountains, rivers, and jungle.

We had waited until dry season, hoping there would be few clouds to impair our visibility, but in the tropics the weather is always undependable. Vainly we waited several weeks for a clear day but finally we took off hoping to break into fair weather farther down the coast. Our 65-h.p. Taylorcraft had 19 gallons of gas in the main and auxiliary tanks.

From the inadequate maps that were available, we had planned to follow the course of the Bayano River to its headwaters, continuing on until we reached the headwaters of the Chucanaque River and following it on back to the Pacific. But when we had flown down the coast as far as the mouth of the Bayano River we still had the 2,000 foot ceiling and inland there seemed to be lower clouds and poorer visibility. We continued on down the coast on the outside of the mountain range that separated us from the Darien country, hoping to reach fair weather soon. After we had flown a little over 100 miles we broke into fair weather with a few billowy cumulus floating overhead.

Then we decided that the best way to learn just how the mountains and rivers actually ran in this section would be to climb on up over the broken clouds and look down through, thus getting a "bird's eye" view of the geography.

We had had to fly southeast from Panama City to follow the coast. So after we had climbed on up to 8,000 feet we turned northward, flying inland over the Isthmus. Everything was fine. It was beautiful to be above the billowy white ocean of clouds with occasional glimpses of the deep green jungles and mountains far below.

We were getting an idea of how the coastal range swept back into the valley to the east when the openings between the clouds became narrower and narrower. This didn't alarm us, since we figured that in a few minutes we would be over more broken clouds. But instead everything closed in below us. Still we were not alarmed and only remarked about the beauty of the sky and the clouds below shining brilliantly in the midday tropical sun. We flew on, generally northward.

And now I began wondering if my gas would hold out until I found an opening. I wasn't quite sure just what direction I had been flying, whether northeast or northwest. I had pumped all of the gas from the auxiliary tank and had been skimming along above the solid mass of clouds for almost two hours.

Those clouds were absorbing heat from a very hot sun and when we came near them, we felt terrific strains put on our plane by the sudden up and down drafts. We scanned the horizon for a spot of land—a dark place that might signify a hole down through to the good old earth, but in vain.

Of course we had no blind-flying instruments nor had I any blind-flying experience. My friend didn't even

(*Continued on page* 101)

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THE LIBRARY

HUMAN FACTORS IN AIR TRANSPORT DESIGN, by Ross A. McFarland; published by McGraw-Hill Book Co., 330 West 42nd Street, New York, N. Y., in 1946. 670 pages. Price $6.

Your reviewer can recall, with no serious straining, when it was the pert custom of aircraft designers to put down their slip-sticks, fire up a smoke, lean back and say, "Well, it's finished. Did we forget anything? Oh, the pilot—Now where in hell will we stick the pilot?" Recently someone bumped into a new idea: Lo, the airplane is a tool, and like other tools has the purpose of extending the faculties of the man who operates it. The tool (and the job) must fit the man. Since this concept is both a practical and an obvious one, engineers are agog. Your reviewer cannot qualify as an aircraft designer but he can as the "human factor," having been one for some 30 years. From my point of view the ideas in this book are not only good, they are vital.

The title is somewhat misleading. Its material will be more useful to operation than to design. When you first riffle through the book it seems formidable indeed, and busy pilots may be repelled. But Mr. McFarland attends his subject like a hurried masseur; a tweak here, a tweak there, a final soul-satisfying slap on the fanny, and out you go.

The author makes no pretense of fully covering his field, but I wish he had included some things like the effect of small changes in pH (concentration of acidity and alkilinity) on the central nervous system of the pilots, and the effect of noise upon the emotions and consequently upon personal performance.

Since in this country it is the fastidious custom for aircraft accidents to be investigated by the men who bear responsibility for causing them, his sources and data in his chapter on the subject are the purest tripe. But the author does give convincing scientific data showing that there are vital times when a transport pilot has more to do than is possible.

The book is largely a collection of matter already available at various other sources. Even so, its information is a must for designers but, it seems to me, even more so for airline and Government air officials. Pilots and flight superintendents who digest it will have a broader understanding of their profession. It would be profitable for the airline heads to make the book available.

Mr. McFarland's job has just started. Better books on the subject will be written, some no doubt by him.

—HY SHERIDAN

JANE'S ALL THE WORLD'S AIRCRAFT 1945-1946, compiled and edited by Leonard Bridgman; published by The Macmillan Company, New York, N. Y., in 1946. 724 pages, illustrated. Price $19.

This is the 34th year of this famous British publication. The 1945-1946 issue, although it was available in England in February, 1946, was issued in December by its American publishers. No explanation for the 10-month lapse is given.

The American edition continues to look like a bad copy of the original. Apparently the finished book is microfilmed in England and the American edition then is produced from the film copy. In any event, the reproduction job is bad, particularly in view of the book's high price.

The contents of this issue are, as usual, the best available anywhere. Mr. Bridgman knows the aviation business and has done an excellent job of compiling the mountains of data on the hundreds of types of aircraft manufactured through the world. The American section is very complete and thorough, but—like the rest of the book—is dated. Coming months late as it has, the American edition should logically be expected to list a number of new American aircraft that are not included in the present volume. Quite a bit can happen in aviation in 10 months.

The prospective purchaser should try to buy a copy of the original British edition before buying this expensive American copy. But if he is willing to overlook the blotched photographs, and feels that the information and data contained in the book will offset the poor pictures, then the American edition is a good buy.

—MAX KARANT

AIRPORTS: DESIGN, CONSTRUCTION, AND MANAGEMENT, by Horace K. Glidden, Hervey F. Law, and John E. Cowles; published by McGraw-Hill Book Co., 330 W. 42nd Street, New York, N. Y., in 1946. 600 pages. Price $7.

Here is a comprehensive text and reference book compiled by three experts in the field of airport construction and management. Horace K. Glidden, eastern editor of *Roads and Streets* magazine, was formerly assistant superintendent of airways of the CAA's first region in New York. Hervey F. Law is the manager of Washington National Airport and John E. Cowles is chief of the airport design unit, first region, CAA. Combining their specialized knowledge and long practical experience, these three have produced a book which every city, county or state engineer should own. Several colleges already use it as a textbook for classes in airport construction and management.

Out of Law's experience in managing the profitable Washington National Airport comes a complete treatment on increasing airport income, and a detailed outline of duties of airport employees.

The legal aspects of obstructions near an airport, and the practical methods of marking or removing them are treated by men whose workaday lives have been harried by this problem for years.

There are no arbitrary standards set up. The engineer is told that runway stresses for landing, parking, revving up engines and braking, still are unknown quantities. But low maintenance costs, the authors assert, are more important than low initial construction costs.

The engineer, say the authors, must be as close to public feeling on the location, design and operation of an airport as any of the city fathers. He may even have to become the advocate of the airport by voice and writing, concerning himself with other than its physical aspects.

—CHARLES E. PLANCK

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AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is: "To make flying more useful, less expensive, safer and more fun."

Headquarters are: 1319 F Street N.W., Washington 4, D. C. Mmbers also receive a special "AOPA" edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

ACCIDENT CAUSES

AOPA-CAB's first monthly survey of lightplane accident causes finds an old stand-by leading all other reasons. Slow, low flying, the CAB reports, is Pilot Enemy No. 1 in accident reports most recently received.

With all returns not yet compiled, indications are that most frequent causes of accidents as a result of low, slow flying are the three factors which inevitably increase stall speeds. Pin 'em in your hat to avoid having them appear in your obituary:

BANKING—The higher the angle, the higher the stall speed.

WARM AIR—Stall speed rises with temperature.

INCREASED LOAD—The heavier the load, the higher the stall speed.

Most careless pilots would have survived the crashes reported to CAB if they had had a couple hundred more feet altitude, the survey shows.

BUILT-IN SAFETY

The Civil Aeronautics Administration is backing up AOPA's "built-in" safety drive by informing all regional administrators of findings made by Crash Injury Research under the direction of Hugh DeHaven of Cornell University, conducting the research with funds which are partially supplied by the association.

The DeHaven unit has reported that poor design is the chief cause of otherwise survivable fatalities.

Other death-dealing items a wise pilot should watch for, according to CAA's complete summary of the DeHaven findings, are:

Solid objects, knobs and sharp edges, within striking range of the head.

Strong, unyielding instrument panels, especially with structural braces close behind them.

Front seats with backs having solid tubing back-rests.

Weak safety belts or strong belts not firmly attached to stout structural members. Shoulder belts are recommended, firmly attached.

Weak control wheels. Many break and form virtual spears.

Affirmatively, AOPA can report recent experiments by the United States Rubber Company with a half-inch-thick sponge rubber which should prove a boon to making cockpits as near crash-safe as is humanly possible. An egg dropped on the material from 10 feet will not break and if an inch-and-a-half pad is used, the egg will not break in a drop from an altitude of 150 feet.

SOLOED AT 53

He may not be AOPA'S oldest member but he is one of the Association's most enthusiastic flyers—Edwin W. Maphis, AOPA 28231, of Charlottesville, Va., (pictured below). At 53, Mr. Maphis made news by soloing recenfly after 15 years of effort to get enough time to learn to fly. He has had the flying bug since 1932, when he was invited by University of Virginia students to join their flying club. Helping him keep his hand in since has been his son, Charles, for 10 years an employee of Bellanca; a second son, George, instructor at Philadelphia's Boulevard Airport, and a daughter, Caroline, who was stationed at air bases

Edwin A. Maphis, 53, AOPA 28231, soloed after trying 15 years to get enough time.

throughout the war. The father did his share by putting off flight training and putting in a considerable amount of overtime work at the Norfolk Navy Yard.

PLANE FACTS

That AOPA's winter campaign will bear fruit toward getting manufacturers to abandon their "to-hell-with-the-customer" attitude in planning designs and sales is indicated by several straws coming down the 1947 spring wind.

Spring and summer sales will see a return to the competitive market and scores of better buys in the lightplane field, reveals a survey just completed by J. B. Hartranft, Jr., AOPA general manager.

The Beech *Bonanza*, Republic's *Seabee* and Erco's *Ercoupe* will be among those leading the procession of planes aimed at pleasing the pilot rather than the manufacturer, the survey indicates.

A buyer's strike, of which Mr. Hartranft warned the industry as early as last fall, resulted in a marked sales decline during the winter and, it is believed, helped lead to stringent revisions in designs and more acceptable pricing. Only two companies, the survey shows, still boasted high production and good backlogs at winter's end. These were Piper and Aeronca.

Mr. Hartranft predicted a good sales year in the lightplane market if the present trend toward business-like merchandising continues.

IMPROVEMENTS

A number of improvements and one new plane were uncovered in the survey.

The new plane is *The Streak*, manufactured by Aeroflight Aircraft Corporation, powered by a Continental 85-h.p. engine, with fuel injection. It has an estimated cruising speed of 150 m.p.h., operates on automobile gasoline, is low-winged with a bubble canopy, and may become a rival to Aeronca, Taylorcraft and Piper trainers.

Continentals figured elsewhere in the survey—technicians on the engine advise that it is not practical to convert existing standard engines to fuel injection because too much engineering is required, including new baffling and cowling in the majority of cases.

It was also learned that the Beech controllable-pitch propeller has been certificated for use on the *Ercoupe's* taper-shaft engines. Tests show that with the new prop the plane picks up 16 m.p.h., or 3,200 extra miles on a 200-hour year.

How to get the most out of the Beech propeller can be determined as the result of the tests. Advice is to level off in cruising attitude and with full throttle turn the propeller to high pitch (full low r.p.m.). Follow this by throttle adjustment returning the r.p.m. to 2,000, then back off on the pitch control to a lower pitch (higher r.p.m.) until the engine is running 2,250 or 2,275. No figures on the endurance qualities of the Beech prop were available at this writing.

CANADIAN BITE

AOPA's investigation of price and service abuses has resulted in a detailed report from Canada, where exorbitant charges are the rule at most airports owing to the fact that they are controlled by the Department of Transportation, the Canadian federal agency supervising flying activities.

Estimates show that in a year the owner of a Piper *Cub* hangared at a DOT field pays out $791.44, not including the cost of maintenance or operation of the aircraft, gas, oil, service, insurance, depreciation, and overhauls. Landing fees alone total $156! END

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944

Revolution in Maintenance

(*Continued from page 27*)

member, because many of them are replaced or repaired during the progressive work period instead of *only* at the normal major overhaul period.

The NATS system sets forth definite work to be done on each series of elapsed hours. The schedule is followed strictly according to chartered instructions, much as a service station operator follows a chart in greasing a car. Thus the work is spread more evenly and an amazing number of manhours per aircraft is saved.

By following this plan, relatively little major work is necessary when the plane is pulled off the operations schedule and placed in overhaul for the fourth engine change. It is back in service much sooner than if it went through periodic major overhauls.

A comparison of the time required in manhours on a plane in the 3,600-hour cycle under a commercial maintenance firm's major overhaul system, and the NATS progressive maintenance system, was compiled by ComNATS. It showed:

Commercial Firm

	Manhours required
First engine change	7,979
Second " "	16,589
Third " "	10,123
Fourth " " (or major overhaul)	24,253
Total	58,944

NATS maintenance squadron

	Manhours required
First engine change	7,684
Second " "	12,061
Third " "	9,860
Fourth " "	11,462
Total	41,067

ComNATS points out that the comparison should not be considered too exact because of several factors. One is that the figures don't cover sufficient time to enable a comparison on one or two planes which were in bad shape, against a couple of planes which were in relatively good shape when they went into the shops.

Conversely, the figures for NATS should be improved in the future due to completion of planned facilities and general improvement in parts supply.

Nevertheless, the difference of 17,877 manhours saved by the Naval Air Transport Service maintenance squadron over the civilian contractor means a savings of many thousands of dollars to any commercial carrier—even if the figures have to be corrected downward by many hundred manhours.

Progressive maintenance tends to even out the overhaul curve of manhours used. "Not only that," says Admiral Reeves, "but progressive maintenance permits us to accumulate definite information as to exactly what operations need to be done, and how often. The result is bound to be the elimination of unnecessary operations and prevention of others by catching them before they become serious items of repair."

He believes that a reduction of 15,000 manhours per plane can be realized for NATS *Skymasters* under the new progressive maintenance program. And he declares that this estimate is "conservative."

Assume the rate of pay is $1.50 per man-hour. A savings of $22,500 per plane results in the 3,600-hour cycle!

This savings goes even higher when it is considered that the plane's time on the ground is shortened and that it is ready sooner for flight schedules.

This was a big trouble in the old major overhaul procedure; planes were held up too long. A complete change of engines was made at about 900 hours. Usually a number of maintenance operations were performed during each of the first three engine changes. The total time for each change for R5Ds was from 4,000 to 6,000 manhours.

At the fourth engine change, or 3,600 hours, the plane was given a major overhaul—practically stripped down and rebuilt. Time required ran from 25,000 to 30,000 manhours.

These four engine changes rounded out a cycle in maintenance and at the end of the fourth change the plane was in the same condition as at the first.

Disadvantages of this system were (1) an unequal workload was created, (2) an excessive number of manhours was required and (3) there was a long lapse of time before the plane could get back into the air. In most cases, just to be on the safe side, a number of major repairs or replacements were made during the major overhaul period regardless of whether they were necessary and regardless of how long it had been since had been done previously.

The new maintenance system was put into actual practice when NATS moved to Moffett Field from Oakland (Calif.) Naval Air Station a few months back.

Hangars at Moffett now utilized by NATS are those in which Navy blimps were previously hangared. Two of these vast hangars, measuring 1,086 feet in length, 234½ feet across, and standing 178 feet high, now are headquarters for ComNATS and house the maintenance squadron.

Size of the hangars made it practical for NATS to institute the progressive maintenance plan. It almost resembles assembly line maintenance; about the only thing lacking is a moving line. ComNATS uses a plastic scale model of the hangar space, with model shops and airplanes properly located to facilitate planning and improve work efficiency. R5D's are rolled into the hangar and picked up by crews which are furnished with charts of work to be done. Every operation is chartered out before arrival of the plane.

The NATS program is under three major headings:

SERVICE MAINTENANCE. This includes all maintenance performed while the plane is in use between the regular scheduled 900-hour engine change periods.

HEAVY MAINTENANCE. This includes all maintenance work performed while the plane is undergoing a regular scheduled engine change. All heavy maintenance projects and bureau changes are made at the time the plane is having its old engines removed and replaced with overhauled units.

NON-ROUTINE MAINTENANCE. This includes certain desired changes on the plane, which differ from all other maintenance operations because they are made only once, or at request, on each plane and are not repetitious. They are scheduled during heavy maintenance whenever possible.

To facilitate the planning, scheduling, and control of the 94 NATS R5D planes involved in the progressive maintenance program, all service and heavy maintenance is broken down into groups of work, each of which is given a numbered designation. The instructions give a list of the maintenance operations, detailed descriptions, and the frequency with which they should be performed

15 YEARS AGO

FROM the March, 1932, issue of this magazine:

An unique antiaircraft searchlight was tested in England. Its beam formed a hollow grid which not only sighted enemy aircraft but also determined height, speed and direction of flight.

Latest tandem-type plane, the Capelis, had six wing motors. These were mounted on universal joints so that the propellers could be pointed up, "to give additional lift."

A ground catapult for launching seaplanes was being tested in Germany.

The new and unorthodox Pterodactyl Mark IV was tailless and had peculiar bird-like wings. A three-place cabin craft, it was powered by a 120-h.p. inverted, air-cooled engine placed in the rear of the cabin. Top speed was said to be around 110 m.p.h.

Fourteen new Vought *Corsairs* equipped with Hornet engines were delivered to the U. S. Navy. They were 23 m.p.h. faster than the planes they replaced.

England's new Camden autogiro proved in tests that it could match the speed of conventional planes despite its formidable superstructure. It was equipped with three rotor blades, considered an improvement over the usual four. Its narrow fuselage provided cabin space for two persons seated tandem-fashion.

The world's largest vertical wind tunnel was being built by the Guggenheim Airship Research Institute in Akron. Constructed of sheet metal in the shape of a letter C, the tunnel was 60 feet long and had a motor capable of creating a wind velocity of 125 m.p.h.

Britain's air university at Hamble had a special course in night flying. Pilots who took the course were required to have logged at least 95 hours solo. They received instruction in dusk landings, night landings with ground flares, and night landings with wing-tip flares only. After completing these maneuvers, pilots were required to make a cross-country flight in darkness.

The ARC-10

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Production is under way and a limited number is now available. For full details, write LEAR, Incorporated, Aviation Radio Sales, 110 Ionia Avenue, N. W., Grand Rapids 2, Michigan.

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according to flying hours. The operations squadron assigns the planes to maintenance at the times specified.

A brief summary of service maintenance, which is broken up into operations known as *Long, Short, Enroute, Preflight, Line Check, Clean and Wax, Reweigh, Run-in of engines,* and *Flight test,* is:

LONG SERVICE CHECK, OPERATION NO. 1. This is now performed between 165-225 hours of actual flying time but tests are being conducted to lengthen it out to 200-240 hours.

Engines, engine accessories, propellers, prop accessories, oil, fuel, hydraulic and electrical systems are checked, as are the heating and ventilating system, while nacelles, wings, fuselage, and empennage structural inspections are made. Rigging, instruments, and radios are tested.

SHORT SERVICE CHECK, OPERATION NO. 2. This is practically the same as No. 1, and is performed at 55-75 hours, but tests are being conducted to lengthen it out to 70-90 hours. Two such checks are made between each Operation No. 1, which occurs at about each 240 hours.

ENROUTE CHECK, OPERATION NO. 3. Performed every 30 hours at enroute stops, and consists of cockpit, crew quarters, fuel tank compartment, cabin, hydraulics, power plants and nacelles, electrical, surfaces and exterior, and landing gear inspections.

First phase of heavy maintenance is Operation No. 21, engine change, and is performed at the end of each approximate 900 hours of flight time.

As has been stated, all engines are changed, propellers are cleaned, inspected and replaced, demountable power plant assemblies are removed and replaced with overhauled units, while engine control brackets, pulleys, and engine mount brackets are checked for condition and security.

Now come other operations which are ordered along with each Operation No. 21. These include, for instance, Operation 41, which pertains to the oil system. Work consists of checking tanks, transfer selector valves and lines, condition of the feathering pump and the oil cooler door cylinders and mechanism; checking for leaks, the drain valve condition, replacing coolers with overhauled units, and checking the firewall shut-off valve.

To show progressiveness, Operation No. 42 is performed at the second engine change, or approximately 1,800 hours, and consists of replacing both the oil propeller feathering pump, and the oil cooler door cylinder. It goes also to Operation No. 44, at 3,600 hours, at which time the plane may receive a complete replacement of its oil system.

Operation No. 51 pertains to anti-icing and deicing equipment, which is tested and inspected at 900 hours, but under Operation No. 52, at 1,800 hours, the entire two units may be replaced, as with Operation No. 54, at 3,600 hours.

Operations Nos. 61, 71, 81, 91, 101, 111, 121, and 131 deal with oxygen and CO_2 units, electrical, heating, instruments, hydraulics, cockpit controls, communications, wings, fuselage and empennage structural inspection and controls and riggings, all of which may result in minor to major repairs, or even replacements, in the 900-hour cycles.

Operations Nos. 72 and 74 concern the various electrical systems and come at 1,800 and 3,600 hours, respectively, at which time several electrical systems may be replaced entirely, depending upon their conditions. This also is carried through to Operation No. 75 at 4,500 hours, which may be further replacement.

Then the plan continues through to such operations as Nos. 36 and 137, which are replacement of fuselage fuel tanks and fuel emergency shut-off valves at 5,400 hours, and complete outer wing panel replacements at 6,300 hours.

Operations Nos. 201, 202, and 203 concern reweighing, engine run-in and flight test, all of which are performed before the plane is put back in service.

From the best available records, although not considered complete in their entirety because of difficulties in cost accounting and material flow during the war years, another startling comparison of cost and time between the NATS progressive maintenance program and a civilian contractor's major overhaul system, comes from NATS records:

First engine change	Contractor	NATS VR-4
Actual labor hours	6,840.60	7,684
Direct labor costs[1]	$9,380.00	$11,526
Overhead[2]	$6,980.88	.....
Materials purchased[3]	$ 155.65	.....
Total cost:	$16,516.53	$11,526
Payable hours[4]	8,107.82	.....
Cost to Navy	$19.041.59	$14.408[5]

Second engine change	Contractor	NATS VR-4
Actual labor hours	16,435.80	10,515
Direct labor costs	$22,502.74	$15,773
Overhead	$17,151.89	.....
Materials purchased	$ 373.12	.....
Total cost:	$40,027.75	$15,773
Payable hours:	$19,475.68	.....
Cost to Navy:	$46,314.41	$19,716

Third engine change		
Actual labor hours	9,527.10	9,860
Direct labor costs	$12,759.46	$14,790
Overhead	$10,639.88	.....
Materials purchased	$ 358.51	.....
Total cost:	$23,757.85	$14,790
Payable Hours:	$11,114.82	.....
Cost to Navy:	$27,891.64	$18.488

Fourth engine change		
Actual labor hours	20,708.60	11,462
Direct labor costs	$27,235.53	$17,193
Overhead	$17,272.47	.....
Materials purchased	1,971.33	.....
Total cost:	$46,479.33	$17,193
Payable hours:	$23,628.08	.....
Cost to Navy:	$52,853.26	$21,491

[1]Contractor: Actual labor costs. VR-4: Based on $1.50 per hour.

[2]Contractor: Includes salaries, operating supplies, taxes, recruitment program. Does not include utilities or rent. VR-4: The $1.50 per hour figure for enlisted men includes overhead such as salaries for administration personnel, engine build-up, tear down and instruments check. Does not include test flight.

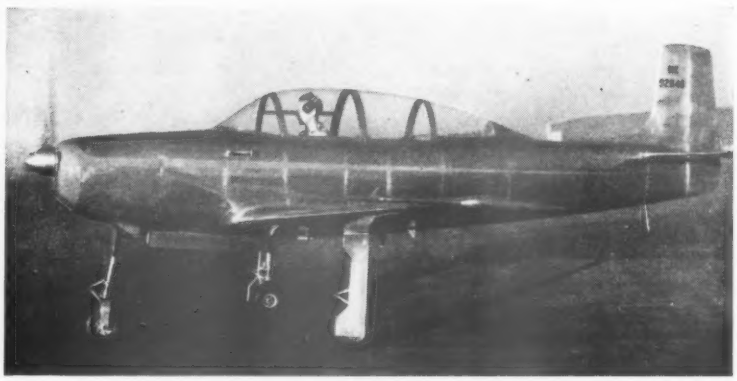
[3]Contractor: Material purchased by contractor for which they were reimbursed on a cost basis.

[4]Contractor: Contractor reimbursed @ $2.55 per payable hour. The difference between payable hours and actual hours is overtime and penalty time.

[5]Allowance of 25 per cent increase in VR-4 figures shown above for possible error.

"NATS is still working hard to improve its progressive maintenance system," says Admiral Reeves. "As experience and studies indicate changes they will be made. We want to make our system operate at top efficiency and yet continually improve the quality of our maintenance. This can and will be done with no compromise to safety."

Under Admiral Reeves' command, planes fly from Argentina to Trinidad, across the U. S. and the Pacific Ocean to the Philippines, Japan and China. In such operations, NATS has impressed upon the public that it is one of the safest, most economical, and efficient of all U. S. airlines—military or civilian. END



IT'S A STREAK!

CRUISING speeds of over 150 m.p.h. on an 85-h.p. Continental engine are claimed for this two-place tandem dual control low-wing plane. It is called *The Streak* by its designers and builders, Aero-Flight Aircraft Corp. of Buffalo, N. Y. Top speed is said to be over 170 m.p.h. and maximum range to be 700 miles. Despite this speed, the Streak stalls at only 50 m.p.h. The engine will operate on 73 octane automobile-type fuel and has fuel injection. After CAA certification, the *DeLuxe Streak* is expected to sell for $3,990, including constant speed propeller, fuel injection, starter, transceiver full instrumentation and retractable gear. Rate of climb for *The Streak* is estimated at 1,025 f.p.m.

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Uncle Sam 'Discovers' the Rocket

(*Continued from page 28*)

significant. For thousands of German pilots have flown hundreds of rocket planes in and out of combat. The Germans designed not one type of rocket aircraft but several, and they took the lead in applying rocket power to such revolutionary robot weapons as V-2.

In 1938 they designed the rocket-propelled Me-163, tested a model in a wind tunnel that year, started construction in December, 1941, and completed the first prototype in less than six months. Hundreds of these little interceptors saw combat. The C version had a top speed of 590 m.p.h. and a final design had a calculated 620 m.p.h. although the war cut off production before the latter could fly.

The case with V-2 is reasonably parallel. Preliminary calculations began as early as 1938 after several years of prior experimentation. Detailed design was started in 1940 and the first successful flights were made in the fall of 1942. When they had finished, the Germans had a revolutionary rocket-propelled missile with a 300-mile range and a maximum speed of 3,000 m.p.h. At its top speed, the rocket motor developed about 500,000 horsepower for a little longer than one minute.

The European war had been over 20 months as this was written. The Bell XS-1 had just flown and several other rocket aircraft were in various stages of design and production. Yet we had no thoroughly flight-tested rocket aircraft and no rocket weapon whatsoever which compared with the German V-2—except, of course, the numbers of V-2's which we captured in Germany after the war.

It has become the fashion in this country, and one which seems to be encouraged by Army and Navy public relations departments, to deprecate all foreign achievements as patently inferior to our own.

The Me-163, we are told, is unimportant because it was not a supersonic plane, whereas the Bell XS-1 is designed for (though it has not yet flown at) supersonic speeds.

As for V-2, why the Germans couldn't have been so smart after all because we have been able to make it perform better than they did.

We are in danger of believing these bedtime stories. If we were so far advanced in rocket and supersonic research we would not have had to import 270 German research engineers and technicians into this country to tell our own experts how to do it. At White Sands Proving Ground, in New Mexico, the V-2 experiments which we boast have set new altitude records, are run not by American but by German technicians. One of the top German researchers here is Dr. Alexander Lippisch, who designed the Me-163. The number of German technicians in the United States will soon be increased to 1,000.

It has even been reported that the German scientists at Wright Field are lonesome—because they don't have anyone who understands what they're talking about—not because they are talking in German but because they are talking an advanced language of supersonics and rocketry.

Lieut. Col. Carl E. Reichert of the aircraft laboratory, Air Material Command, speaking before the Annual convention of the American Rocket Society in New York last December, made a significant statement concerning the state of much of our research. Referring to design studies with the propulsive units at the wing tips, Colonel Reichert says, "they look quite promising on unswept wings but from *German data* they cannot be tolerated on a swept wing." What is plain from this is that there is no American data on the subject.

The reasons why are no mystery. Prior to the war neither the Army nor the Navy took any interest in rocket motor development, either to propel aimed missiles such as the bazooka rockets, guided missiles such as V-2, or aircraft such as the XS-1. If you had mentioned rockets in the sacred corridors of Washington in 1939 you would have been an object of pity—or worse.

Years ago the Army turned down research on the pulse jet duct engine such as powers the German V-1. No agency in this country was working on jet propulsion of any kind—rocket, ram jet or turbo-jet—including NACA, which is charged with responsibility for aircraft and engine research.

We have heard all our lives that Americans are the great scientific pioneers and other countries the great copyists. There is supposed to be something in the air of our country and the fiber of our people which just naturally breeds fearless and unorthodox experimentation.

If you went to school in the 1920's as I did, you heard a different story about the Germans. Patient, thorough, an unimaginative plodder — there was your typical German. The other countries (but mostly America) made the big discoveries and the Germans only copied and in some cases improved upon them. No one expected the German to do original thinking, he wasn't built for it.

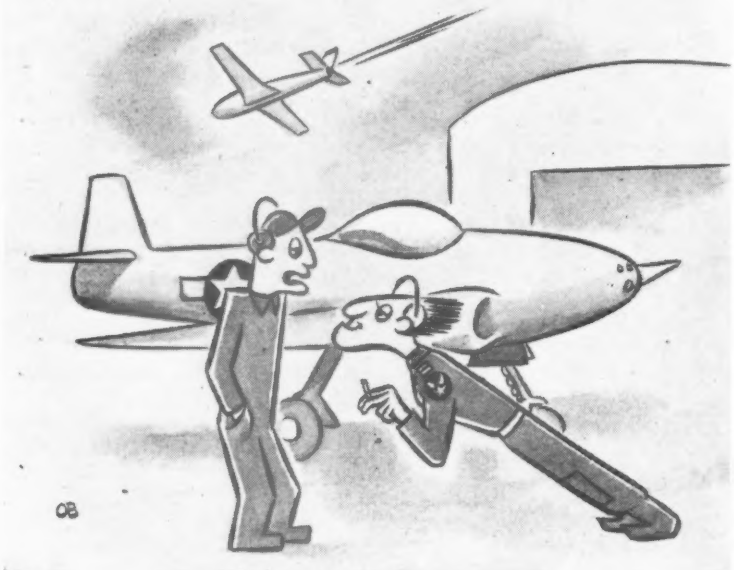
Apparently we have been suffering from arteriosclerosis of the imagination. It was the Germans and not the Americans who made the outstanding contributions to rocketry. It was the British Frank Whittle and not the Germans who invented the turbo-jet engine.

The reasons why seem to number at least three. First, the armed services of this country have resolutely resisted revolutionary innovations. Secondly, Americans themselves have not been research-minded. They and not the Germans have tended to apply research practically — and mainly in those instances where it has been profitable in a monetary sense, or where monetary profits seemed at least possible. Third, this general outlook has necessarily been reflected in the outlook of Congress, which has refused to make substantial research appropriations in the past and is only now beginning to realize the dangers of such a policy.

If you will permit a contradiction, it was neither the Germans nor the Americans who did the first basic research on rockets but a lone American, Dr. Robert Hutchings Goddard, who died in 1945 after 30 years of rocket investigations.

Dr. Goddard was a Clark University physicist who used his personal funds and several slender grants from the Smithsonian Institution, the Daniel and Florence Guggenheim Foundation and others to do research in rockets.

In January, 1920, the Smithsonian In-



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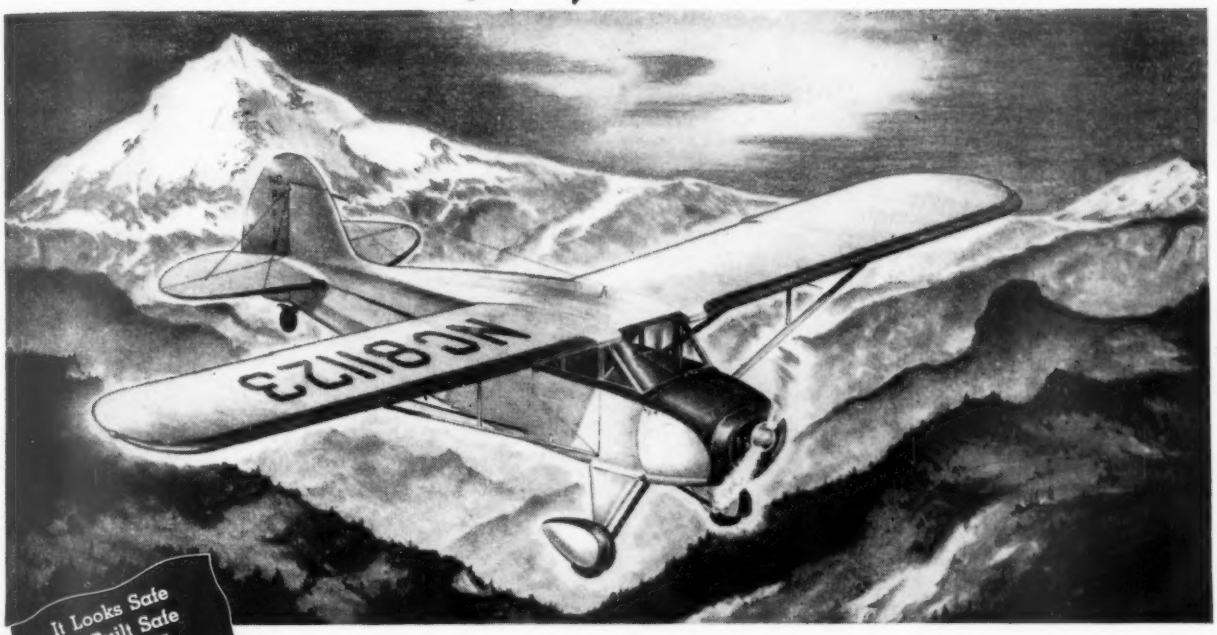

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stitution issued a 69-page (plus plates) paper-bound pamphlet called "A Method of Reaching Extreme Altitudes," which set forth Dr. Goddard's basic calculations. This paper attracted wide attention in this country and in Europe. Alfred Africano, Curtiss-Wright research engineer, credits Dr. Goddard with writing the fundamental equation by which rocket performance can be determined. "Given certain data now known, the equation could have been used nearly 30 years ago to predict the V-2 and other developments."

Dr. Goddard's research was so significant that his ideas were "copied wholesale" by the Germans in the V-2 projectile, Africano asserts. It is even reported that when American scientific teams began quizzing German scientists about their rocket work, the puzzled Nazis said: "Why do you ask us these questions? They have been reported by Dr. Robert Goddard of your country, who gave us many of our ideas." Whether this story is true, here are some of Goddard's accomplishments:

1. Wrote the fundamental rocket performance equation.

2. Proved that a rocket would work better in a vacuum (or in space) than in the atmosphere—and that rockets worked by reaction, not by the rocket gases pushing against the air.

3. Built and fired the world's first smokeless powder rocket.

4. Built and fired the world's first liquid-fueled rocket in 1926.

5. Worked out such vital details of liquid-fueled rocket construction as regenerative cooling and film cooling which are considered basic by today's best rocket builders.

6. Was granted 62 patents on rockets.

7. Worked out details on and fired the first practical automatically-steered (by gyroscopes) rocket.

8. During World War I Dr. Goddard developed a bazooka-like rocket which fired intermittently, something like a repeating rifle. He also developed rocket-projectiles designed to be fired against tanks and military objectives from a launching tube. These weapons were demonstrated successfully at the Aberdeen Proving Grounds November 10, 1918. The war ended the next day and the data on these weapons was forgotten in the War Department files.

And what were the results of these accomplishments? In the United States virtually nothing except private experiments by the American Rocket Society until the war started. Dr. C. N. Hickman, wartime chief of the Rocket Section, National Defense Research Committee, recently described how he and Dr. Goddard made a number of specific proposals to develop rockets as a defense measure prior to World War II. The armed forces were interested in only one of their many proposals — a method of accelerating armor-piercing bombs to obtain a high degree of accuracy.

The only serious rocket experimenters in the United States during the early 1930s appear to have been Goddard and the members of the American Interplanetary Society, later the American Rocket Society, which was organized March 21, 1930. For some reason there was virtually no liaison between the two. Goddard apparently kept many of his experiments secret, fearing, no doubt, sensational news stories which in the past had pictured him as an irresponsible moon scientist.

The society's experiments with liquid-fueled rockets started in 1932 and some of the top rocket men in the country today were early members of the American Rocket Society. These include Africano, Pendray, and John Shesta and James H. Wyld of Reaction Motors, Inc., builders of the well-known XS-1 motors.

Attempts have been made to show that Goddard's work actually was the basis for the German advances. It is equally likely that the independent research of the Germans resulted in much the same conclusions as the American researcher had reached. The point is, however, that the American researches for the most part were carried on independently by hobbyists out of their own resources. They did not result in nor were they intended to result in practical war weapons. Rocket scientists were generally regarded as a queer lot who expected to take off for Mars day after tomorrow or anyway next year.

It was different in Germany.

European interest in rocketry, which was virtually non-existent at the end of World War I, was stimulated by Goddard's paper and fanned to a flame by Herman Oberth's "By Rocket to Planetary Space," published in 1923. James H. Wyld of Reaction Motors, Inc., says that "this remarkable book developed the general mathematical theory of rocket projectiles in much greater detail than any previous author (including Goddard—Ed.), and also presented a number of strikingly advanced ideas on rocket motor construction."

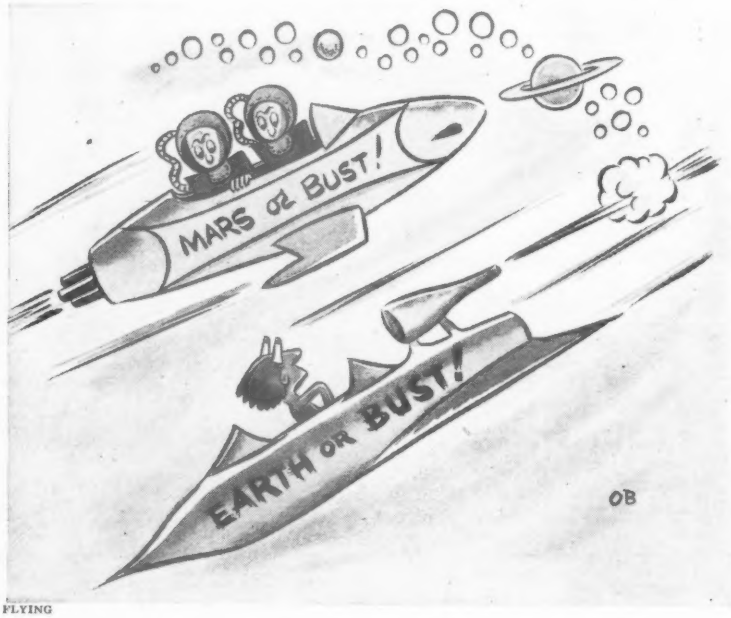
The first results of Oberth's book were Sunday supplement-type articles on the rocket-trip-to-Mars vein. Many U. S. physicists felt they couldn't risk their reputations with such nonsense.

Practical accomplishments didn't show up until about 1930. By that year, the German Society for Space Travel, which had been organized in 1927, began a series of tests on various types of liquid-fueled rocket motors. The results were probably only medium-successful—they were a step toward modern motors.

And then in 1933 the German Army took over the experimental work and it became a secret military development. Activities expanded greatly. In 1934 and 1935 the first rockets with regenerative motors, cooled by their own propellants, were built. These were not too successful at first and in 1936 a huge new research center was set up at Peenemunde on the Baltic Sea. This is the rocket center that the Russians have taken over since the war ended. A full time staff of several hundred men was at work on rocket development and by 1938 a successful motor of over 2,000 pounds thrust had been manufactured, known as the A-3. The A-4 motor of the V-2 is essentially a scaled up model of the A-3.

James Wyld says that "even at the present time, the boldness of the V-2 project is startling, and it ranks second only to the American atomic bomb as the most revolutionary military development of World War II.

"It was necessary to increase the size of the previous A-3 motor, already by far the largest in the world, by a factor of about 20 . . . It was necessary, for example, to work out fuel injectors that would properly vaporize and mix no less than 287 pounds of propellants a second, and to burn them efficiently in a combustion space only three feet long and three feet



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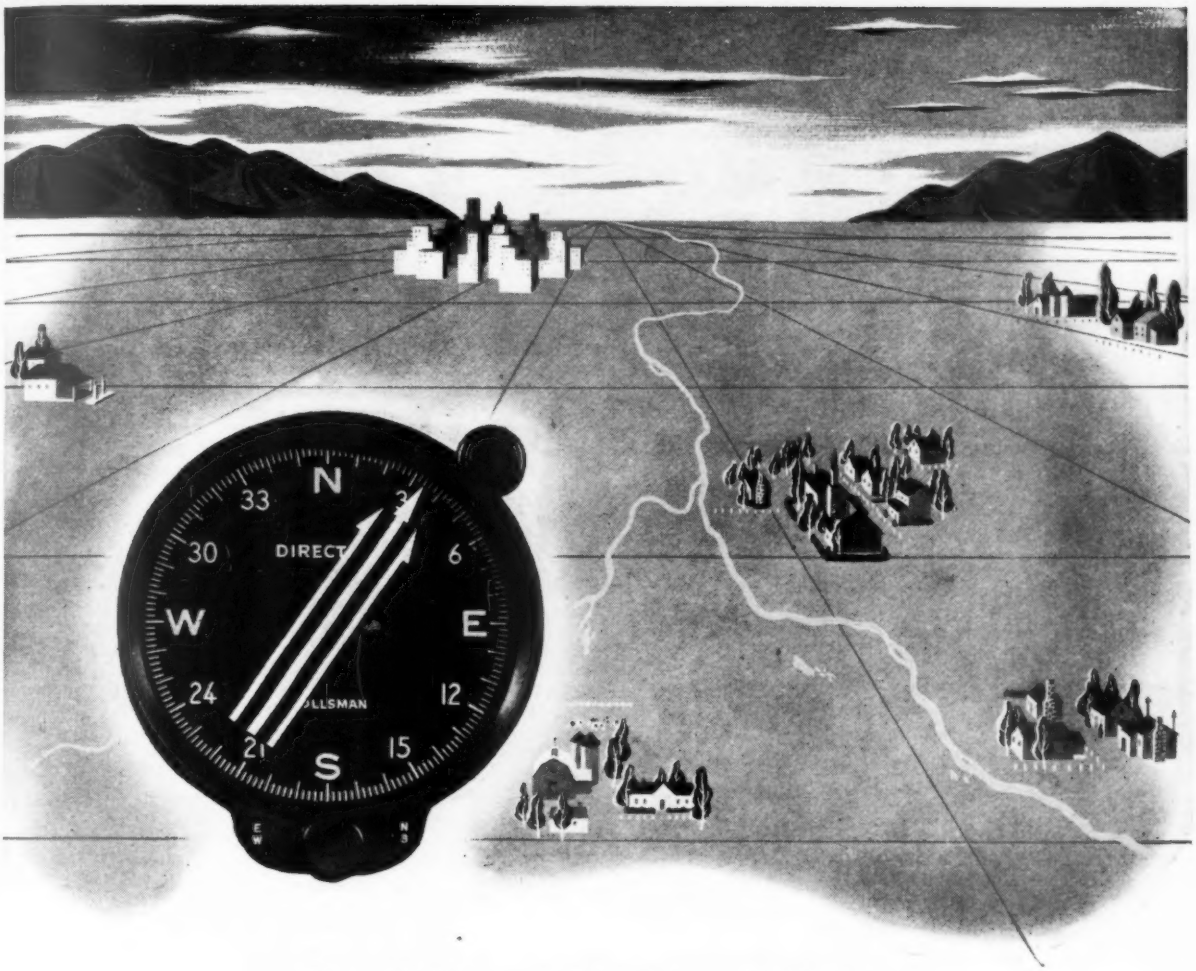

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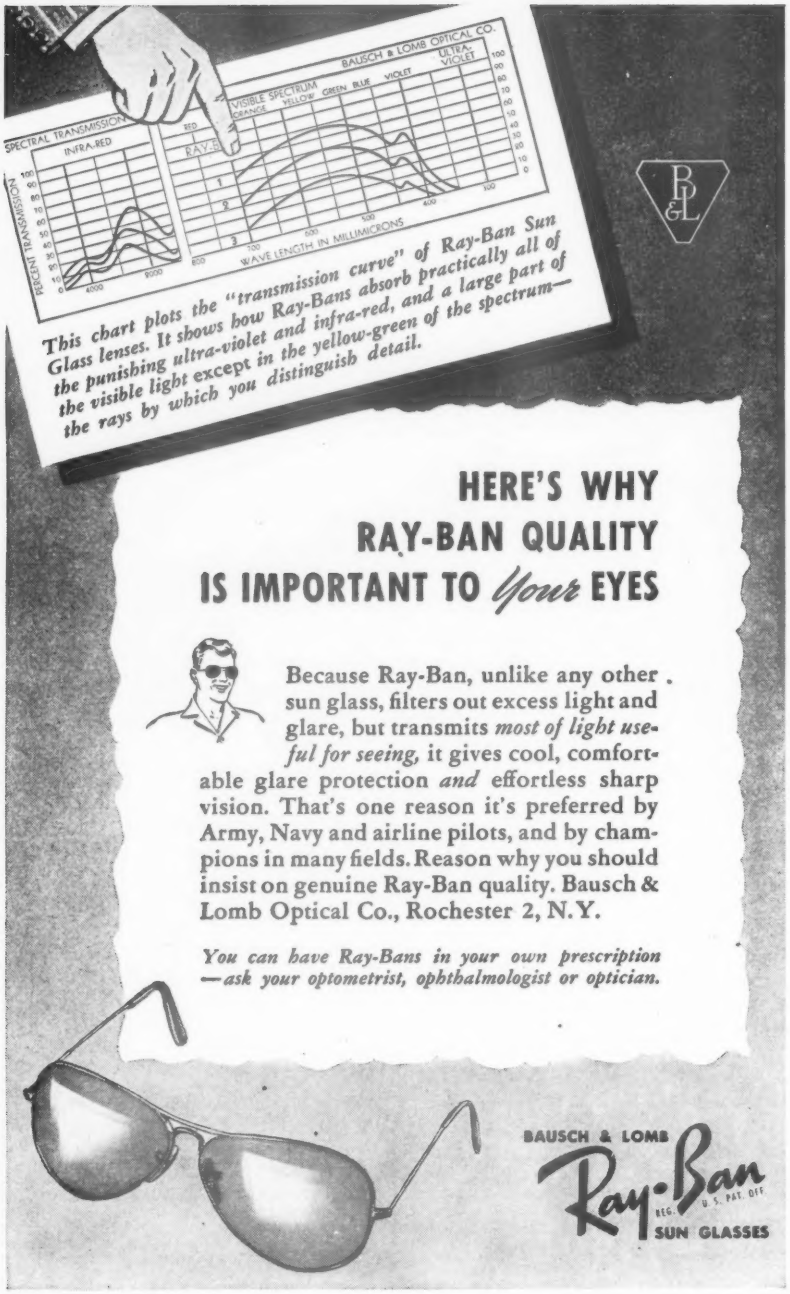
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So much for V-2. The Germans went on to develop the Me-163, the successful rocket-propelled intercepter and a series of other designs, one of the most interesting of which was the *"Natter" ("Viper")* or BP-20, which was conceived in August, 1944, and had a wing span of less than 12 feet. Initial rate of climb was 37,000 feet per minute—a vertical ascent rate of 420 m.p.h.! The power plant had a thrust range of 330 to 3,850 pounds. The BP-20 had made nearly 20 unmanned launchings before war's end.

And meanwhile, what was going on in the United States?

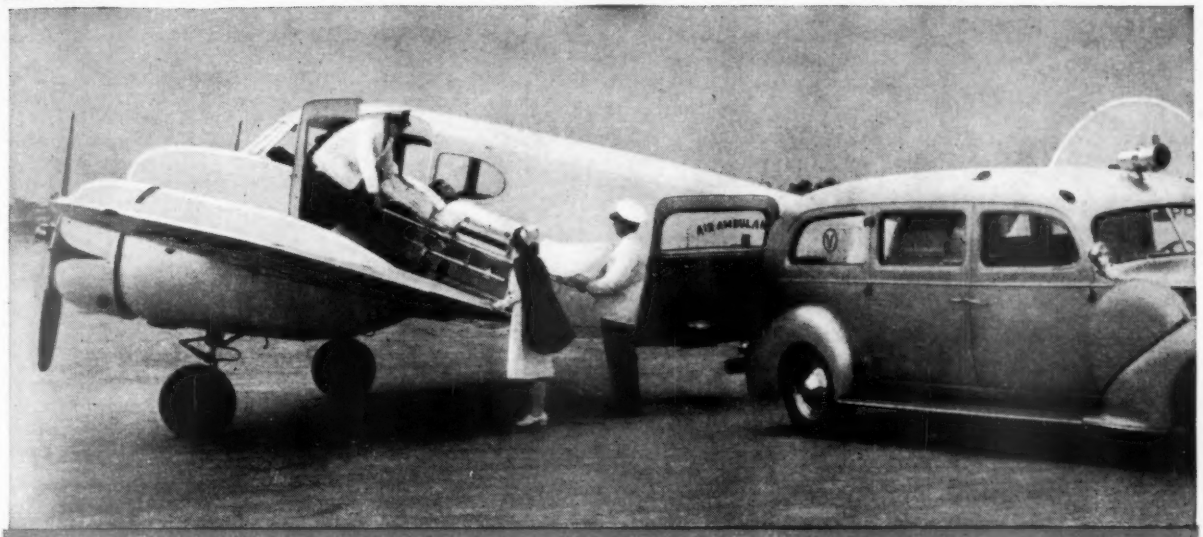
The American Rocket Society began serious experiments in 1932. The regenerative cooling jacket made its first appearance in practice in 1933. The first American design to apply regenerative cooling to all parts of the motor was made by Wyld in 1938, and after further tests, Reaction Motors, Inc., was started in 1941 by several members of the American Rocket Society to develop motors of this general type for military applications. The first models up to June, 1942, were similar to the original 1938 design and developed only 100 pounds thrust.

With fewer than 20 workers, in one year's time performance had been increased up to 3,400 pounds thrust by May, 1943. It had taken the Germans four years, several dozen men and over $1,000,000 to achieve the same thrust (but a poorer jet velocity).

Much recent work is confidential. Data has been released on one motor which has four cylinders and can deliver a thrust varying from 1,000 to over 6,000 pounds. The motor will develop 12,000 brake horsepower at 750 m.p.h. and rated 6,000 pound thrust, and weighs only 210 pounds. It uses the same propellant as V-2—liquid oxygen and alcohol. Besides Reaction Motors, Inc., GALCIT and Aerojet Engineering Corporation of Pasadena are building regenerative rocket motors.

Larger U. S. motors are known to have been built than any yet announced but it is believed that none of them yet approach V-2 in thrust. The large number of German rocket scientists now working in the United States may justify predictions that before long we will be leading the world in rocket developments—at least until the Germans go home or until Congress decides that we can't afford to spend any more money for research.

As for the reasons for our own backwardness, there need be no more authoritative statement on the subject than that by James Wyld that " the lack of American rocket research has not been due to any inherent lack of technical skill, but was caused solely by the prevailing attitude of ridicule and indifference to the whole subject which blocked almost all advance for at least 10 years. It is true that there has been a very drastic change for the better in this respect in the past year or so . . . it is about time the public should run a fever." END



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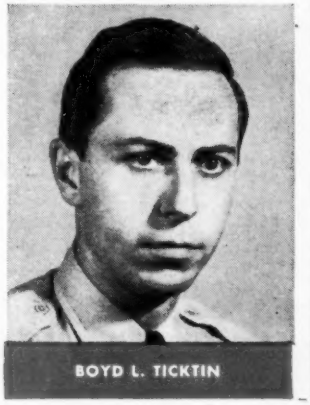

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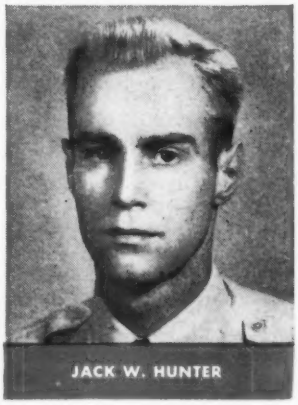

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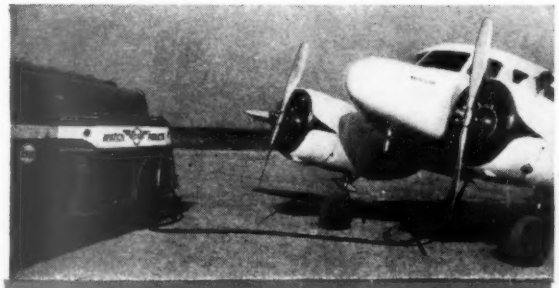

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TO BE A VALUABLE AID in *any* aeronautical endeavor is the first job of Esso Aviation Products. With constant product quality, never-ending research, and friendly, efficient service, the Esso Wings serve American aviation!

Fog Factory

(*Continued from page 50*)

tanks of enormous capacity, and then brought back into the open—upwind of the landing strip. It is believed the warmth of this solar-heated water, just a few degrees above ground temperature, probably will cause the fog in the vicinity to evaporate.

And one of the most promising methods to rid airports of fog is a wind-curtain plan. Top researchers believe this would be the most economical and practical dispersal method but unfortunately they will not be able to set up the system until funds are made available.

Under this plan, large heating units will be installed underground and hot air from them will be shot into the sky at terrific force along the entire length of the runway.

The wind curtain would be parallel with the runway and at right angles to the prevailing wind. The curtain would form a barrier to the wind, creating an eddy over the runway and maintaining the heat over the runway itself to clear the deadly fog.

Similar to the wind curtain is a water screen experiment which may be tried, this also depends on financing. The plan is to project a curtain of water approximately 100 feet into the air. Water would cause the fog particles to coalesce with the water screen particles and all would fall to the ground. The water curtain would be installed on the side of the runway nearest the prevailing wind, thus removing the fog particles before they reach the runway, reducing the amount of heat necessary to clear the fog.

Since the Arcata base was turned into a joint Army-Navy-civil experimental landing aids base (it was formerly a Navy auxiliary air station), the main project has been the improvement of FIDO (Fog, Intensive Dispersal Of).

FIDO was set up by Great Britain to enable bombing planes to land at fog-bound British airports. Gasoline burners, fired by torch, were set about a field and the generated heat would slowly lift the fog. It cost from $4,000 to $5,000 to land one plane with FIDO—an extremely expensive method but well worth while compared with the value of the plane saved.

FIDO was first used by U.S. on July 25, 1944, at Amchitka in the Aleutians, always a dangerous fog center. Just prior to dawn, the burners were ignited and the fog lifted from zero-zero until the sky became visible. A Navy *Catalina* took off and landed. The same day an Army *Skytrain* made two successful take-offs and landings.

Success of the Amchitka installation indicated a need for additional experimental work, with emphasis on efficiency and economy. A landing aids experimental program was established, sponsored by the Landing Aids Section, Maintenance Division, Naval Bureau of Aeronautics.

The war was still in progress and the immediate goal then was the development of equipment suitable for use in the islands north of Japan in case we came in that way.

After war's end, it was decided that work on low visibility landing equipment should continue. Arcata was decided upon for the joint operation because of its site. It sits off a bluff which rises abruptly 200 feet above the surf. The warm, moist air from the semi-permanent eastern Pacific cell of high pressure becomes fog-laden as it moves eastward over the cold California current. This fog pours over the bluff onto the airfield like a thick, viscous mass.

The problem of dispersing fog is primarily one of removing fog particles from the air over a limited area. With the developments of radio glide and localizer

Hole in fog 1,700 feet deep can be seen in background above fuel burners along runway. Burners are Navy design.

beams that line the plane up with the runway, FIDO needs only to give a ceiling of 150 to 300 feet. A plane coming in on the beam can make a contact landing after reaching the end of the runway.

The thermal method of dispersing fog is one of releasing heat into the atmosphere by the combustion of fuel. The temperature in the lower layers of atmosphere is sufficiently raised so that the fog particles evaporate and become water vapor.

Numerous thermal systems are installed at Arcata. These include the Slot burner, a British product; a Hades-Rapex installation, which has an extremely high thermal output; non-glare burners designed by the Army Air Forces and the newest system, a high-pressure unit which burns a low grade fuel after it has been atomized.

All the systems can be controlled by one operator with a push-button panel in the control tower. This panel permits control of the amount of fuel fed to the systems and allows ignition of the systems from the same panel.

While the systems are in operation, aerologists are busy collecting data. During each burn, information is obtained about the size of the fog particles, the amount of free water per unit volume of air, the air temperature, dewpoint and wind velocity and direction. At regular intervals before, during and after the burning operation, the ceiling and visibilities are taken in the area being cleared. In this manner it is determined exactly how much clearing is being accomplished. On one occasion, fog reaching up to an altitude of 3,500 feet was burned through to the blue sky over the 6,000-foot runway in five minutes.

The high-pressure thermal unit was constructed to burn a low-grade fuel and thus reduce cost. The fuel is atomized through a specially-designed nozzle at 1,750 pounds pressure.

This system generates twice the amount of heat obtained from other systems. As the high pressure fuel is pushed out of the atomizers, it is ignited by Calrod ignitors. It can be ignited immediately, while the other systems need a three to five minute preheat period in order to vaporize the fuel.

Cost of the system at any commercial airport, completely installed from pump house to control tower push-button operation for a 6,000 foot runway, is estimated at $185,000 by Robert L. Champion, director of the base. Cost of operation is from $25 to $45 per minute during actual burning.

Each of the systems are tested by the Landing Aids Experimental Station pilots in this manner: They take off over the fog-dispersed runway and fly into the soupy weather. Then they make turns on instruments and enter the radio high-frequency, glide-path-localizer system—a blind-landing instrument approach system now being adopted by many airlines and known technically as SCS-51. As they continue to fly the glide path, they suddenly break out of the fog to find a clear runway in front of them. Then they land contact.

One unusual aspect of these landings is that often the plane comes in on a runway that is just as clear as a bell over its entire length and for a few hundred feet upward, although the personnel in the control tower only a short distance away are unable to see the runway or the plane!

Taking another tack, Arcata experimenters flight-tested a new landing light arrangement late last October which guided pilots to the ground from 400 feet in zero-zero conditions.

This system consists of 101 high-intensity lights which line the full length of the runway and extend 3,000 feet southeast to funnel planes into the approach.

Pilots using the system make a routine instrument approach until they enter the converging lines of approach lights. These lights are mounted in gradually descending heights and guide the pilot down toward the runway. The approach lights are white.

When the pilot passes over four yellow lights arranged in pairs on either side of the runway, he knows it is time to flare off and land. He makes his landing in a green-lighted area which extends for the first fifth of the runway. He can then roll along a white-lighted runway until the plane stops.

These lights, which have a high fog penetrating quality, have been used in landings under fog conditions so thick

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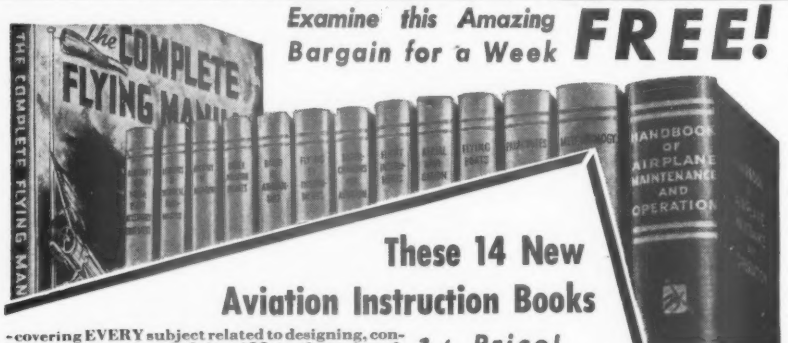

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that pilots were lost on the ground once they had pulled their planes off the runway and onto the taxi strips.

The cost of installing the system at Arcata excluding a voltage regulator for varying brightness control was $70,000.

On the agenda of test work at the all-weather base are:

1. Installation of many other approach and runway lighting systems, to be used mainly during low visibilities present in rain.

2. Evaluation of such materials as magnesium dust, coal dust, carbon particles, etc., in colloidal suspension in all fuels for fog dispersals.

3. Investigation of a method of setting up sufficient mechanical turbulence to break through the inversion present in radiation fogs in order to utilize the heat already present in the atmosphere.

4. A variable capacity dispersal system to be tested in an effort to reduce the cost of removing fog.

5. Installation of a GCA (ground controlled approach) system to compare it with other landing aids.

6. Testing of a microwave localizer and glidepath apparatus to evaluate it against SCS-51.

7. Investigation of radar beacons and other navigational aids.

8. Establishment of traffic control procedures to determine the minimum safe landing intervals with the assistance of landing aids.

9. To test the weathering qualities of various aviation equipment.

10. To determine the water accumulation resulting from the transfer of aviation fuels.

11. To investigate the value of crash barriers and fire fighting equipment.

12. To check advisability of using a contrasting surface brightness for the runways for small airports and whether runways of contrasting brightness would aid in seeing them sooner during low visibility conditions.

The word "finance" crops up frequently in test work proposals at Arcata. So far there is no single department of Government under which the Landing Aids Experimental Station is co-ordinated. Consequently, the Army, Navy, et al., make separate appropriations for work they wish done individually.

"When the whole program and the jurisdictional problem are straightened out," says Champion, "we will be able to accomplish much more work in perfecting landing aids than is now possible."

Meanwhile, any private individual or company may have the use of the station to try out any invention dealing with landing aids. The cost must be borne by the experimenter but the field facilities are readily made available to him.

Approval must be given, however, by a steering committee made up of 10 military and civilian members all connected with the co-sponsoring agencies.

"Every idea submitted is carefully considered and most of them are tested," declares Champion. "It takes a lot of ideas to find the best solution."

And from the best solution will come untold benefits to aviation through the safety gains for all-weather flying. END

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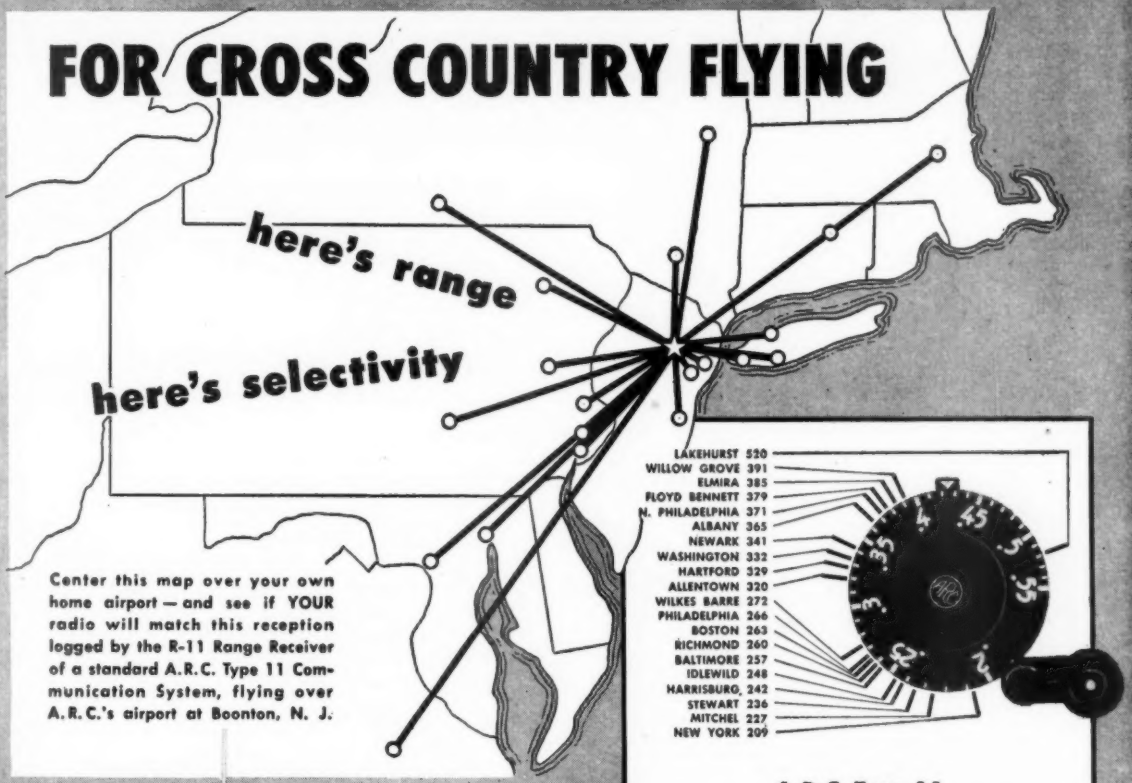

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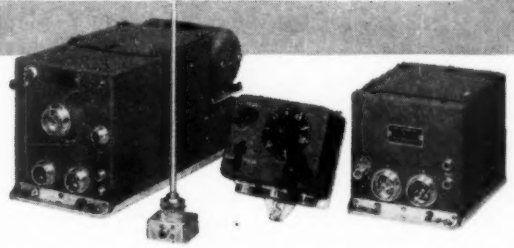

Experienced pilots will tell you that reception like this—the ability to pull in the range signals and weather reports from any station within two hours flying—means safety as well as convenience in cross-country operations.

However, many pilots may not yet know how superior the new A.R.C. T-11 VHF Transmitter is for getting your air-to-ground communication through. Try it yourself—many CAA stations and towers are now guarding the new VHF frequencies of 122.1 and 122.5 MC.

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Float Facts

(*Continued from page 40*)

Edo floats to be produced are the model 1,650s and 2,000s for use on the Cessna 140 and Piper *Supercruiser*. The engineering approach to cutting float costs has been through close attention to detail design—elimination of riveted joints and fewer parts machined fittings, castings, forgings, etc. Where previous floats of this general size had approximately 3,325 longitudinal rivets, the new ones have only 1,925. Since each rivet represents a manufacturing cost of about five cents, a considerable saving results from that simplification alone.

Other manufacturing simplifications bring direct production costs down from $4.75 to $2.27 per pound, more than offsetting increased costs of material and labor.

The aerodynamic effect of floats on the handling or performance of an airplane is surprisingly slight. The cruising speed on most fixed-gear models is reduced about five per cent because the floats and their struts offer some additional drag over a fixed landing gear. For a float installation on a retractable gear type plane the difference is greater.

Balance is not seriously affected, since the center of gravity of the floats is directly below the center of gravity of the airplane. The extra weight of the floats below the airplane does, however, lower the position of the center of gravity about 10 inches on an average lightplane. This lower center of gravity accounts for a more solid and stable sensation which the floatplane pilot experiences. This change improves, if anything, the "feel" of the aircraft.

The addition of floats on most planes *does* reduce the directional stability of the plane and for that reason extra fin area sometimes is necessary. The float are almost the equivalent of an additional fuselage and since the largest part of their area is well forward, directional instability may result. The problem is handled very simply by adding a fin under the fuselage where the tail skid usually fits, or by the installation of small auxiliary fins atop the stabilizer.

It seems odd to some people that all civilian float installations are twin-float while standard Navy installation consists of one main float with smaller wing-tip floats for water stability. For the Navy's purpose, the single-float installation is prefererable since all Navy seaplanes must be capable of being catapulted. For civilian aircraft the arrangement is not as satisfactory as the twin-float installation for several reasons. Wing-tip floats required on the single-float type make docking difficult. The "mortality" on wing tip floats under civilian use would also be too high. In addition the wings must be specially stressed to withstand loads imposed by the wing tip floats should they strike a wave on landing. Twin floats are a little easier for taxiing and make entrance and exit from the cabin simple. For lightplanes without starters it is mandatory that the pilot be able to stand on the float to spin the propeller.

Some pilots ask why amphibious gear is not available for light aircraft when tests were run with such installation in 1938 on a Waco and a 65-h.p. Taylorcraft. Standard floats were modified to house two retractable main wheels, aft of the step, with two skids at each bow to give a "quadruped" effect. During the war this principle was adapted directly to floats for the Army's L-1 and eventually for the Douglas *Skytrain*.

The engineering and design problems of such floats have already been solved but there remain several practical drawbacks, soon to be overcome, which make lightplane amphibious floats out the question this year. The two obstacles are excessive weight and high cost. On the Taylorcraft, the additional weight of floats, wheels and retracting mechanisms, came out of the useful load of the landplane, making it a one-place craft. The installation of amphibious floats on the *Skytrain* was justifiable for military exigencies despite the fact that 2,600 pounds were cut from the useful load.

However, we are continuing the development of amphibious floats for lightplanes, and have a highly successful basic design. We feel that the installation of amphibious floats on three- or four-place aircraft—with the loss of one passenger seat—will be possible economically within the next year or so.

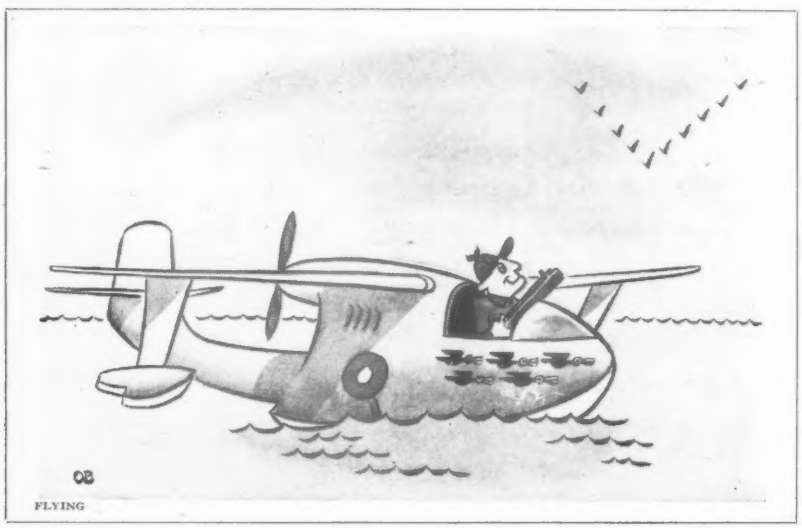
An important consideration in amphibian design is the difference in CAA rate-of-climb requirements for landplanes and seaplanes. To be approved, a landplane (or an amphibian) must climb at a ratio of 1 to 12, while a more shallow rate of climb of 1 to 15 is permitted for seaplanes. This is because seaplane operations are invariably conducted on rivers or lakes whose size provide "runways" many times the length of normal airports. This among other reasons permits installation of floats on relatively low-powered aircraft without any seeming loss of performance. As soon as the seaplane becomes an amphibian it must meet landplane climb requirements. Along with the extra weight of landing and flotation gear, the more stringent climb requirements make additional horsepower necessary. For that reason the privilege of amphibious characteristics costs more in the form of additional first expense and higher operating costs.

The matter of the extra weight of floats and its effect on lightplane payloads has not been well understood by the average plane owner or pilot. Until the CAR was revised recently, the extra weight of floats had no bearing on payload since a reduction in maneuvering load factors as a seaplane was permitted. This allowed a greater gross weight for floatplanes than landplanes and it was seldom necessary to restrict baggage allowance.

The innovation of the normal category for civilian aircraft has permitted higher gross weights for normal cross-country use, which results in a relative lessening of seaplane payload. Nevertheless, a respectable baggage and equipment allowance is still possible.

Those who fly floatplanes know that the water rudder should be retracted for take-offs and landings. This procedure sometimes seems unnecessary, but there are definite reasons for it. On take-off the rudder is not needed since the airplane is headed into the wind. Also a down rudder bangs up and down and strains the fittings at high speeds on rough water On landings, the initial contact with the water will make the rudder swing upward with a jolt and cause severe strain The present rudder was developed for maximum control and efficiency. We found it necessary to install it below the keel line where it can get a good "bite." Naturally, for tail-in beaching and maneuvering on the ground, the rudder must be retractable to prevent damage.

The square, butt ended stern of the float, nautically known as the transom seems to be very unstreamlined. In slow aircraft the drag is negligible and the flat transom makes for simpler construction and offers definite hydrodynamic advantages. At high speeds the floats ride on the main step and the transom serves as another step. Were the floats streamlined to a point, as in the Navy floats, an extra step would have to be built in and,



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of course, the cost would have to be a great deal higher.

Anyone who has landed on rough water and experienced the jolting and jogging as the floats slap the crests of the waves may wonder why some form of shock absorbers can't be incorporated in the struts—or why the front attachments of the floats can't be mounted on the axles of a normal landing gear. This would not be practical from a number of standpoints. For one thing, as the shock absorbers are compressed, the tread of the landing gear becomes greater. This would mean flexible mounting of the rear struts and would spread the floats out of line with the path of the plane through the water. Other difficulties of similar nature would make such a plan impractical.

These discussions of the various aspects and problems of float design and installation indicate that there may be many problems involved in owning a floatplane. Our engineering solutions have been thoroughly tested and the explanations here have been developed to discuss the most important of them. The equipment available today for float flying is the end result of more than 20 years of development and improvement. It is tops in efficiency and durability. END

One Air Law—or 49?

(*Continued from page* 35)

trailer unit having a gross weight load of approximately 60,000 pounds; in New Jersey you will have to shorten your equipment to 45 feet; in Pennsylvania you will be required to reduce your load by 15,000 pounds. In Illinois you will have to reduce your load to 40,000 pounds and your length to 35 feet. In addition several of the states through which you will pass require fees varying from $24 to $250. These fees have various names such as registration fee, compensation fee, gross weight tax, operation fee, gross receipts tax, and mileage tax. As for licenses—have you ever noticed the number of license plates which interstate truck operators carry?

Aviation has had a long head start in the transportation field because some far-sighted men in Congress undertook Federal legislation long before the states attempted any.

Under present Federal law the authority to pass safety rules and regulations for aviation is vested in one organization. The pattern set by that organization in its 1945 revision of air traffic rules, pilot standards for private pilots and operating standards for private and commercial pilots and operators, illustrates what can be done when aviation has but one organization to deal with. The revised rules are simple and comparatively free from burden. Further, whatever individual opinions may be concerning the wisdom of any particular rule or regulation, there is this positive advantage:

There is but one set of rules, regulations and standards which the pilot must meet; one set of safety requirements with which the commercial operator must comply. There is but one set of airworthiness requirements for the manufacturers. Everyone wants uniformity. Everyone wants to have one pilot license which is good everywhere; one aircraft license, one set of standards, inspection and operation rules to follow. No one has suggested that there would be any advantage in having 48 sets of rules or standards.

Notwithstanding this unanimity of opinion, state officials and Federal officials spend hours and days that add up to weeks and months of discussion, arguments, drafting and endeavoring to put legislation on the books of the 48 states to duplicate and interfere with Federal legislation and which serve merely to add burdens to the pilot, the aircraft owner and the operator. So far the only reason given that seems to justify this effort has been that unless the states can enforce safety rules and regulations, aviation will be retarded by the failure to curb careless, reckless and hazardous flying.

There is some merit in this argument. It cannot be expected that with the expansion of flying which has taken place during the past 12 months the Federal Government, which has had its civil agencies geared for limited wartime activities, could have provided the complete coverage necessary for an adequate job of enforcing the regulations. Furthermore, there is no indication that Congress intends to appropriate sufficient funds to do the job and no one has suggested how the Federal Government can meet the needs for enforcement under the expanded activity without adequate funds.

The question then is: Can uniformity be maintained; can the

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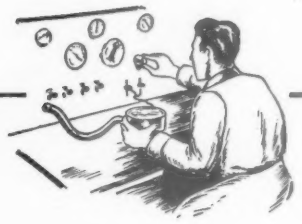

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many additional and greatly varied burdens which lie in the duplication of Federal regulations by the states be prevented and the states still have an opportunity to participate in enforcement when they find it necessary? There is every reason to believe so. The history of state and Federal enforcement makes it difficult to understand why there is an endeavor to complicate the situation by passing 48 sets of safety rules and statutes.

The solution suggested is state enforcement of Federal rules and regulations. Legally, there is no objection to this procedure. The Supreme Court of the United States, as early as 1876, gave a thorough review of the problem and pointed out that the states and Federal Government were not foreign to each other. The recognition of this authority is found in the first legislation passed by Congress in 1789.

The solution has been given some consideration by the Civil Aeronautics Board. By the use of state enforcement procedure, aviation would need only one book, one certificate. Rules and regulations would be uniform everywhere. The pilot from Maine would not wonder what particular rules or requirements he would find in Louisiana.

Obviously, such a system would require co-operation between the states and the Federal Government. We are finding in every phase of our national life that this co-operation is essential. Its effectiveness is amply illustrated in other fields of which the Department of Agriculture, and particularly the Agricultural Extension Service, is only one example.

Aviation knows no boundaries. Pilots and pilot organizations must give this problem consideration and discussion. While aviation achieves uniformity of rules and standards abroad and makes international flights free from burdensome restrictions, can we do any less than this here at home? END

Lumberman's Airport

(*Continued from page 55*)

fathers slapped on record a ruling forbidding establishment of any airport within the city limits without the express approval of the council. But this legislation could not affect the Dwyer's flying because they had been using the airport —non-commercially—before the ruling was passed.

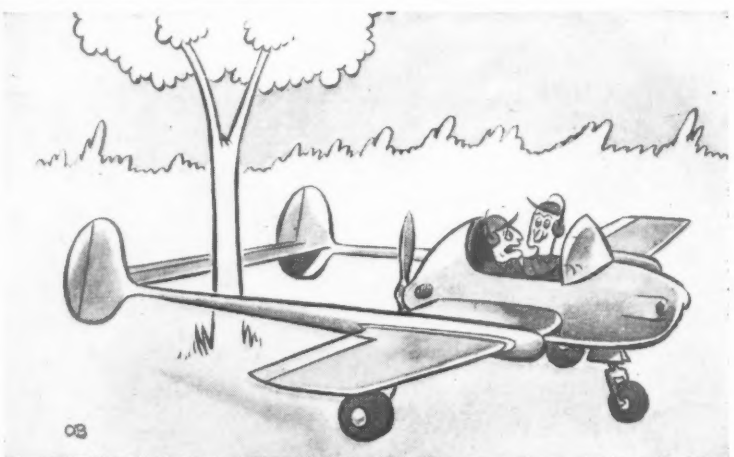
However, the legal doings quashed all hopes of the Dwyers operating a full-blown commercial airport. At a meeting of the city council, Wiley Wright of the Civil Aeronautics Administration and Leo G. Devaney, Director of the Oregon State Board of Aeronautics, were instrumental in getting permission for the field to be used by transient pilots for take-offs, landings, servicing and tie-downs. But the council would not permit rentals, charter operations and student instruction. In other words, no commercial flying of any kind.

There is still more legal and legislative work pending and eventually the Dwyers may emerge with a commercial airport. Portland wants the airport and even the four property owners who originally objected have withdrawn their complaints.

In addition to the strip at the sawmill, the Dwyers have had a contractor carve out a landing strip 3,600 by 150 feet in the woods near their cutting operations. This strip, which cost $4,500, is used by the Dwyers for their logging business and by any private pilot who wishes to land there. Both this timber strip and the sawmill strip are used by the U. S. Forestry Service for Government planes.

Flying will pay off, the Dwyers believe. They have sold their first plane, a *Cub Coupe*, and purchased a Commonwealth *Skyranger*. Just before Christmas they bought a war-surplus Grumman *Widgeon*.

These sawmill planes will be put to many uses; as transports, ambulances and as pleasure vehicles. They save time and get places faster and more comfortably than can any other means of transportation. The Dwyers believe that using the airplane in the woods is good business—no matter what happens in the city. END



"O.K., so you did land it; let's see you take it off." FLYING

What to Eat When You Fly

(*Continued from page* 31)

units consists of meals rich in carbohydrates and the more digestible "fats." Milk, cream, butter, eggs, simple salad dressings and vegetable oils, olives, avocados, nuts, whole-milk cheeses; fresh and stewed fruits, potatoes, and other root vegetables; ice cream, custards, and other similar popular desserts; in fact all the more digestible foods of high caloric value.

Foods to balance "over-work" of the heart and respiratory system consist of such mineral-rich foods as green vegetables (where safe), nuts, milk, cheese, etc. Fresh green salads are especially recommended. It is vitally important, however, that such greenstuffs raised in the tropics be supervised by the local government. Produce obtained through domestic markets in non-tropical countries is, invariably, quite safe.

Food to be avoided includes undercooked food of any kind, and highly-spiced or "gamey" foods. Fried foods are not desirable. Neither are soft, doughy bread, onions, mushrooms, garlic, rich gravies and sauces. Vegetables most prone to excessive gas forming should be avoided, including certain beans, cabbage, cauliflower, Brussels sprouts, and similar foods. Lobster, crab, and shrimp should not be eaten by the flyer immediately before or during a flight.

Flyers should drink plenty of water but should constantly assure themselves that the water supply is well protected.

Carbonated soft drinks partaken of frequently and in small quantities are both refreshing and helpful in relieving intestinal gas discomfort. Tea is to be preferred to coffee and, either hot or cold, is an excellent and safe stimulant and a great aid in counteracting fatigue. Milk, of course, is always valuable.

Correct food sanitation is of outstanding importance. Many minor digestive upsets are really mild cases of food poisoning due to poor sanitation. The food buyer must personally inspect foodstuffs and thoroughly investigate their condition.

The clothing and habits of all food handlers must be kept absolutely clean. All kitchens, food containers, carrying utensils, dishes, cooking utensils and kitchen equipment *must* be *kept* immaculately clean and be frequently sterilized.

Special attention should be paid to the conditions of cold meats before serving. Cold meats, particularly the white meats —poultry, etc.—should not be held over 48 hours from cooking to serving and should certainly not be re-heated later.

Hot foods should not be kept under heat for over two hours after cooking, and should not be re-heated later.

Foodstuffs in cans that have swelled, and bottled goods that have become discolored should never be used. Canned goods should be used as soon after opening as possible but, contrary to popular opinion, the unused portion of the contents of a can of any food item is best left in the can for storage purposes.

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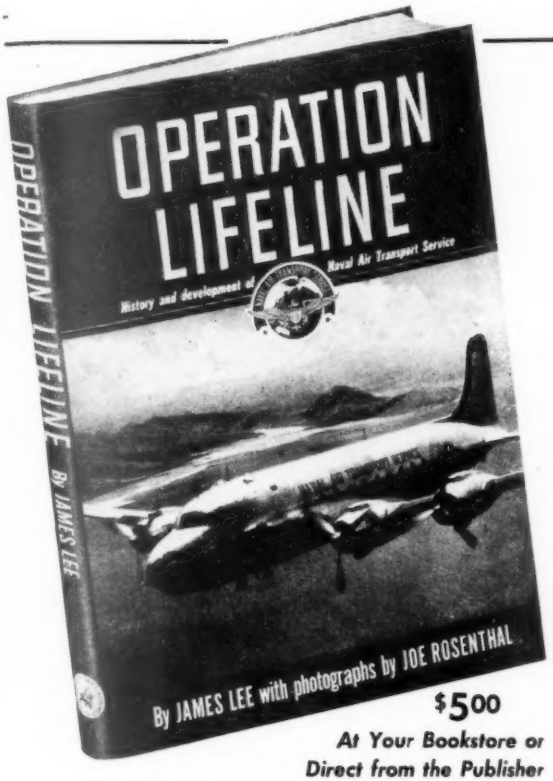
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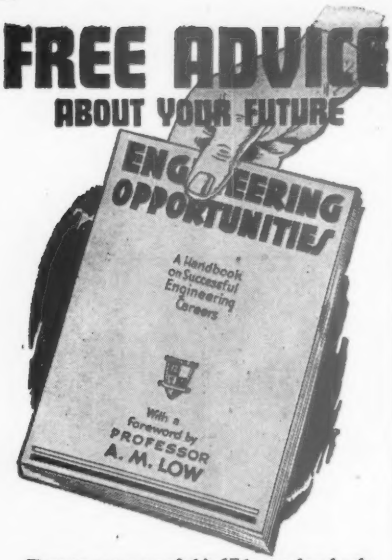
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90 per cent .....Flight instructor
80 per cent .....Commercial pilot
70 per cent .....Private pilot
60 per cent .....Student pilot
50 per cent .....Dilbert

Answers are at the bottom of the page.

1. *According to Civil Air Regulations, a student pilot before making his first solo flight is required to have dual instruction of at least*
A. no specified amount. B. 8 hours. C. 10 hours.

2. *When a pilot "drags the field," he*
A. lands with wheels retracted. B. makes touch and go landing. C. inspects the field as a possible landing area.

3. *Two airplanes take off from LaGuardia Field, N. Y., flying a heading due west. Plane A is a light trainer which flys at 100 m.p.h. Plane B is an airliner flying at 300 m.p.h. At the end of one hour, Plane A has drifted 30 miles south and plane B has drifted south*
A. 10 miles. B. 40 miles. C. 30 miles.

4. *Planes flying at night have lights on the wing tips. Their colors and arrangement are*
A. both green B. red on left wing and green on right wing. C. red on right wing and green on left wing.

5. *The stratosphere is distinguished from the troposphere on the basis of*
A. altitude. B. temperature. C. atmospheric pressure.

6. *Aerobatics is specifically forbidden over*
A. a country fair. B. an airport. C. a civil airway.

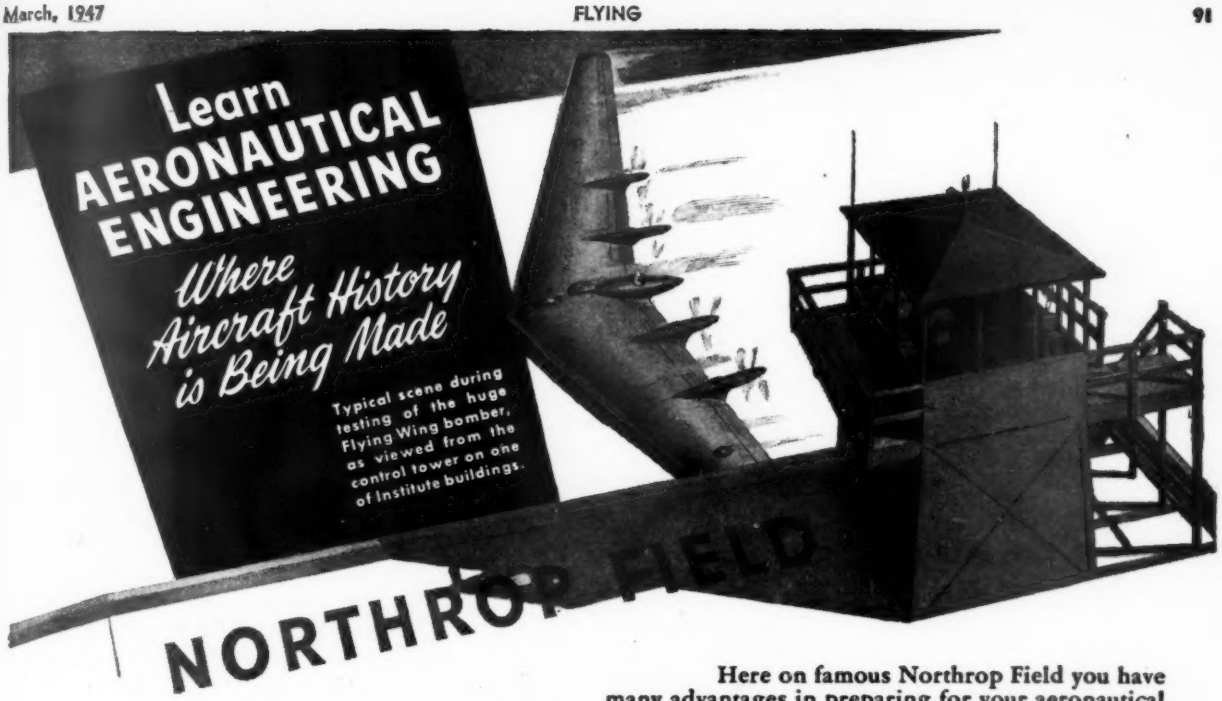
7. *A cirrus cloud is composed of*
A. ice crystals. B. water droplets. C. mist or fog.

8. *If you were flying in a commercial plane at 5,000-foot altitude and your engine stopped, the distance you could glide (if there were no wind) would be*
A. about one mile. B. between one and three miles. C. more than six miles.

9. *Your airplane carries four hours' fuel supply (plus reserve). You wish to leave Denver at 12 o'clock noon and fly due west, returning at the end of four hours. Your cruising airspeed is 100 m.p.h. and at your flight altitude there is an east wind of 50 m.p.h. Before turning back, you will fly west*
A. 1 hour. B. 1½ hours. C. 2 hours.

10. *"Over the top" flight is*
A. skimming the treetops. B. flying above the clouds. C. inverted flight.

1. A—A student pilot may solo whenever a certified flight instructor considers him competent and endorses his student log book to that effect.
2. C. 3. C. 4. B. 5. B.
6. A—Current regulations forbid acrobatics over open-air assemblies of persons.
7. A. 8. C. 9. A. 10. B.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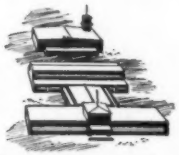

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Lightplane Bust—or Boom?

(*Continued from page* 18)

Super Cruiser 7,000, and the Republic *Seabee* a total of 5,000.

These manufacturers are notably enthusiastic. Beech deliveries started in January and the company was in full production on *Bonanzas*. Jack Gaty, vice-president said: "I believe that 1947 will be the best year yet for the sale of personal airplanes and business airplanes although I expect the market to show pronounced selectivity with customers' preference for modern types as the determining factor."

Bellanca is producing six planes per day and is provisioning for 1,000 more airplanes to follow present work in process. Distributors are being canvassed to determine rate of production after May 1, G. M. Bellanca reports.

"We are highly optimistic re outlook for 1947 for four-place private planes," says F. J. Morgan of North American. Up to January 10, 278 *Navions* had been delivered and production was going ahead with good speed.

Mundy I. Peale, new president of Republic, reports that "Dealers state unusual utility of *Seabee* Amphibian warrants optimism that *Seabee* market will hold up despite possible sales reductions of other types. We believe the four-place market will be good, but much is still to be accomplished in facilities, airports and other plane needs."

Piper is operating at its highest rate in history, with 3,000 employees. The Lock Haven plant is producing 30 *Super Cruisers* per day in two shifts. "I believe the personal plane industry as a whole will see continued adjustments but as far as Piper is concerned, 1947 promises to be the busiest year in our history," William T. Piper reports.

Four-place plane manufacturers, then, are optimistic. The situation is not quite so clear for two-place plane builders but a good many of them are continuing to build aircraft at unprecedented rates. Piper is in good production on Cub Specials at Ponca City, Okla. Cessna is still in maximum production at the rate of 30 per day. "Aviation business has just passed its usual seasonal low and we anticipate a very good volume of personal planes sales with our 1947 planes," reports Don, Flower, Cessna sales manager.

Much of the slump which bothered other plane manufacturers a few months ago can be blamed on the usual seasonal slow down. Ercoupe, which halted production for some time late in 1946, has resumed on a 10-day basis. Leopold H. P. Klotz, president of Luscombe, says somewhat ominously that the personal plane outlook for 1947 "appears to be fair for those companies still in production." A good many two-place plane builders are planning "family-size" planes in the future but may not have them ready for 1947 production.

Given a favorable business atmosphere, assuming a flow of materials for planes and for landing fields and hangars, adequate salesmanship, and production sufficient to keep costs low, then personal planes' sales in 1947 will at least equal those of last year, apparently. Any unbalance in these factors will result in a lower unit volume, although dollar volume probably will remain high because of the swing to higher-priced two- and four-place, all-metal family and business type planes.

John W. Friedlander, chairman of the Personal Aircraft Council, Aircraft Industries Association and president of Aeronca Aircraft Corp., recently reviewed the problems of the personal aircraft manufacturer. Citing the 1946 production, he commented, "It seems quite a paradox that although we have achieved this splendid production record there are few among us who profess to see the bottom dropping out of the personal plane market. I would like to state quite emphatically that I cannot sympathize with those who hold this pessimistic view. On the contrary, I feel that the personal plane industry is confronted with a marvelous opportunity to establish itself as one of the basic industries in the world of transportation."

Any definite forecast of manufacturing during this year is extremely difficult. The production of new transport planes appear a fairly stable factor, despite some cancellations by the airlines. In addition, the filing of portal-to-portal pay suits is an unknown which is worrying all industries. There are several general factors, such as economic trends, which will affect plane purchases, progress towards the solution of landing facilities problems, and the shortage of hangar facilities for personal aircraft.

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for traffic volume in 1946. The number of revenue passengers carried by the domestic companies exceeded 13,000,000, or approximately 78 per cent more than in 1945. The Air Transport Association reports that the revenue passenger miles passed the 6,000,000,000 mark; express and freight shipments by air increased about 57 per cent to a total of more than 37,600,000 ton-miles.

Emery Johnson, Secretary of the ATA cargo section, sees excellent prospects this year for the scheduled airlines. Percentage-wise, he said air cargo export predictions run as follows: air mail to increase 75 per cent; air express to increase 30 per cent; air freight to increase several hundred per cent.

Assistant Postmaster General Gael Sullivan is an aviation enthusiast and has plans for extension of air mail, introduction of air parcel post, the use of helicopters, and other extension of the use of air by the Post Office Department. The introduction of five-cent airmail resulted in a 40 per cent increase in volume in the first two months of operation.

All of these things will benefit the industry generally. Despite what seemed like an alarming number of accidents, the safety record of domestic airlines surpassed all previous years. The ATA reported the number of aircraft in service at 816, of which 655 were operated domestically and 161 to points outside the United States. This compares with 495 as of Dec. 15, 1945, of which 397 were in domestic use and 98 to points outside the United States.

The ATA reports also that more than $1,000,000 will be spent by the airlines this year in studying and putting into effect means and methods of improving schedule reliability, bettering passenger service, and safety.

Traffic prospects for 1947 are for continued growth, though probably not at so accelerated a rate as in 1946. Some researchers in the air transportation field have forecast 7,800,000,000 passenger miles for the domestic carriers this year, although others regard that figure as slightly on the optimistic side.

Forecasts for the financial prospects of the airlines are virtually impossible to make at this stage, but outside of a few sour notes, the overall song sounds good. If costs do not continue to rise, it is expected that most airlines will be able to recoup the losses occasioned in 1946 by the expenses of fleet, route and personnel expansion.

Feeder system routes are expected to be expanded to around 26,000 route miles at the very minimum.

There is a wide divergence of opinion throughout the industry as to the advisability of increases in passenger fares. Some feel that the 1946 decreases should never have been made. Others believe that, psychologically, they were helpful. There is general agreement on the need for increases in mail pay rates.

The possibility of a full-dress Congressional investigation of the industry is not entirely out of the picture. Should it come, the industry on the basis of its war record should fare well, although here again the surface carriers may try to make capital of mistakes which the airlines were bound to make in their stratospheric expansion.

With transition completed and new models in production, 1947 should show considerable improvement over last year. These should be a continuation of the industry's basic growth trend, distorted by the war. Unfavorable factors appear to have depressed leading airplane stocks unduly.

While the long-term outlook for the leading and well-established personal plane manufacturers appears promising, there is some doubt that many of the smaller companies can survive. With almost 200 enterprises interested in personal aircraft, the mortality rate is bound to be high.

Most manufacturing companies should break even or show only small losses for 1946 after application of tax credits to absorb reconversion costs and some development expenses. Earning prospects for 1947, according to a survey by Wall Street House Hornblower and Weeks, appear encouraging. Latest reported unfilled orders are for 51,203 airplanes with a value of almost 1.2 billion dollars. With reconversion expenses charged off and new models in production, results should score notable improvement over those reported for 1946.

There are many factors in the condition of the aviation industry which may call for doses of aspirin, but none that call for tears of despair. END

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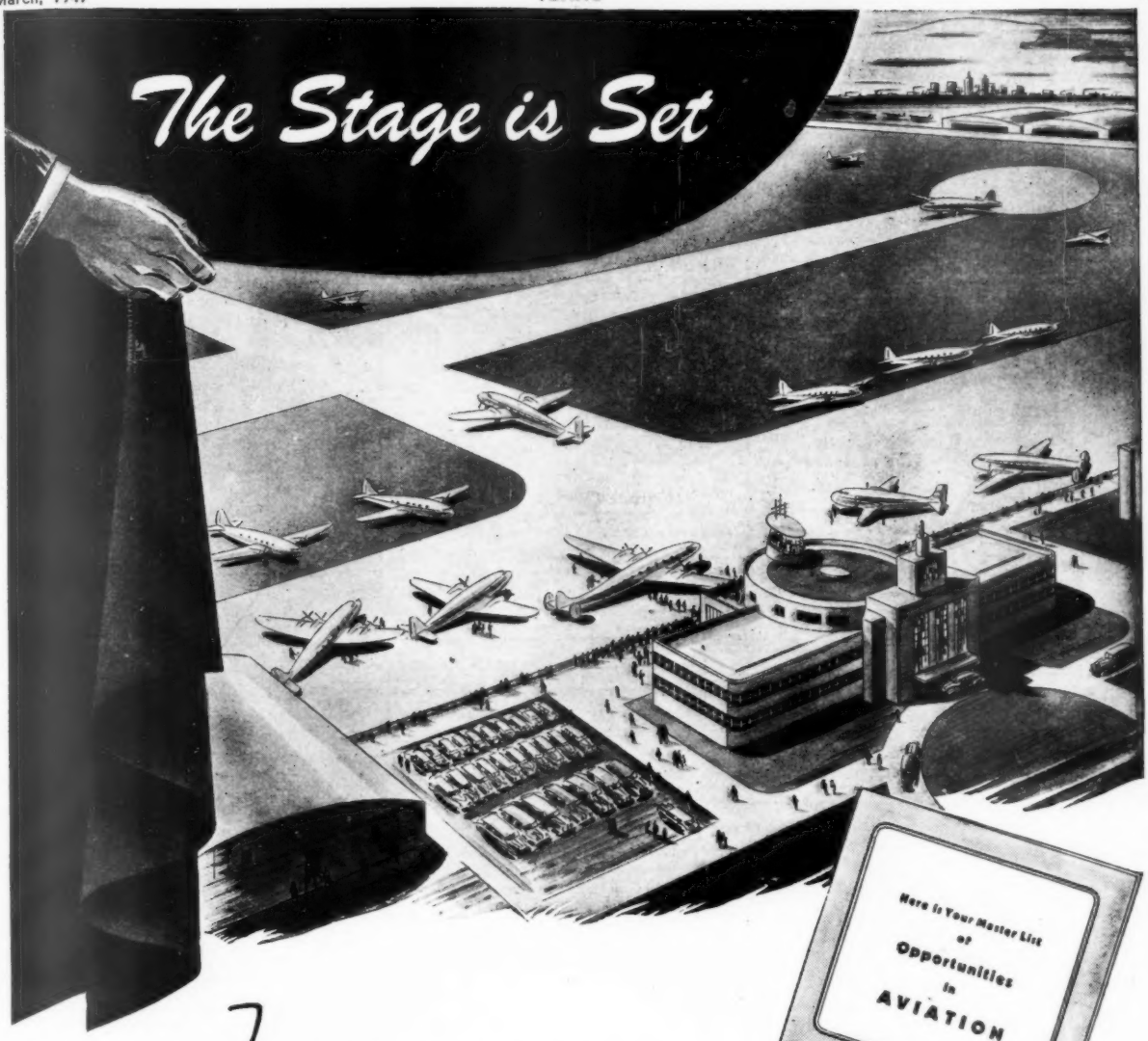

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The Super Cruiser

(*Continued from page 36*)

widely-used military plane in the world.

But Piper didn't put all his eggs in the J-3. His engineers started "stretching" the J-3 design. They came up with a two-place sport plane with a 75-h.p. engine, produced as the *Cub Coupe*. Only a comparative few were sold—which set Bill Piper to thinking. He wisely saw that the two-place airplane was not going to be able to satisfy the market for inexpensive personal planes forever.

The answer to that one is the *Super Cruiser*, which is simply a J-3 with hair on its chest. Is that bad? Not so you'd notice it. While many lightplane manufacturers are out beating the bushes for sales, Piper has enough back orders for *Super Cruisers* right now to keep him going well into 1947. Why? Because this safe, reliable, and highly-useful personal plane—which carries three people, has a 100-h.p. Lycoming engine, sells for no more than many two-place airplanes.

So, in effect, the *Cub* design still is going strong. Inside, the *Super Cruiser* looks like a big J-3 with a two-place back seat. The same dual controls are there, the two throttles are the same; so is the trim tab. It flies very much like the trainer, except that it takes a while to learn how to slow it down enough to land without floating across the airport.

The *Super Cruiser*, in other words, has just about all of the advantages of the trainer—with a lot more power and performance to boot. The one I flew for this article—NC-7858H—got off the ground into a nine-m.p.h. wind in under 10 seconds. Our gross weight was 1,588 pounds, 162 pounds under the normal maximum of 1,750 pounds. I was accompanied on the flight by Roy H. Levite, sales manager of Tufts-Edgcumbe, Inc., Piper distributors in the Chicago area. The airplane was their regular demonstrator.

PIPER SUPER CRUISER

Approved Type Certificate No. 780

One 100-h.p. air-cooled Lycoming engine	
Wing span	35 ft. 5.5 in.
Length	22 ft. 10 in.
Height	6 ft. 10 in.
Gross weight (normal category)	1,750 lbs.
Gross weight (utility category)	1,500 lbs
Empty weight	950 lbs.
Wing loading	8.36 lbs./sq. ft.
Fuel capacity	38 gallons
Top speed (sea level)	115 m.p.h.
Cruising speed (75% h.p.)	105 m.p.h.
Stalling speed	49 m.p.h.
Range fully loaded	600 miles
Service ceiling	14,800 feet
Rate of climb	750 f.p.m.

Source: Piper Aircraft Corporation

As soon as I left the airport traffic pattern after take-off, I pulled up into the *Super Cruiser's* maximum climb; best rate of climb is at a minimum of 70 m.p.h. indicated air speed. So I climbed at 70, from 1,200 to 2,200 feet above sea level. The 1,000-foot climb was made in 00:01:22, for a rate of just over 730 f.p.m.; Piper claims 600 f.p.m. when the airplane is fully loaded.

The *Super Cruiser* is difficult to stall. If the trim tab is left in neutral, it's next to impossible to stall it. With the tab rolled all the way back, it takes a strong arm to pull the stick far enough back and hold it. Then, when the airplane does stall, it just sinks forward, nose first, at about 45 m.p.h. indicated. The wing does not drop. The airplane will spin, but that too requires same manual effort by the pilot. You can maintain altitude at about 50 m.p.h.

This airplane is quite comfortable for cross-country flying. It was cold outdoors the day I flew it (temperature 23, dew point five, wind WSW nine), yet the heater kept me quite warm. However, there were a number of air leaks around the doors and windows, making for rather strong drafts in the cabin. Aside from that, though, I could have made a cross-country trip in shirt sleeves.

If my experience with this particular airplane was typical, you can expect to make good a cruising speed of between 105 and 110 m.p.h. on the average cross-country flight. I flew a 55-mile triangular course and, with that nine-m.p.h. wind, averaged just about 110. Indicated air speed could not be recorded accurately; the airspeed indicator got clogged with

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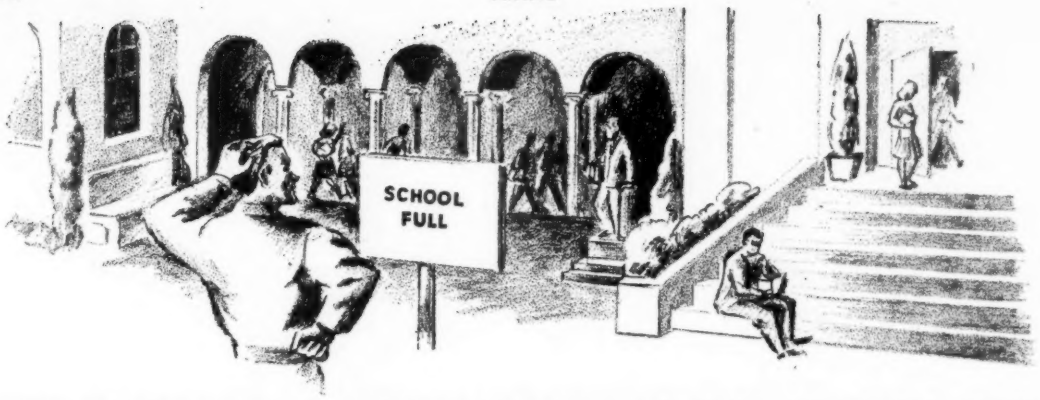

A FRANK DISCUSSION OF TODAY'S CRITICAL AVIATION TRAINING SITUATION

The aviation training situation today is a little short of desperate. Nobody's to blame. There are just too many applicants for too few schools. As a result of this unfortunate condition, many deserving young men—particularly veterans eager to accept the benefits under the G. I. Bill of Rights—must postpone indefinitely their aviation training.

The young man who starts his training NOW will win aviation's highest rewards

It is vitally important that a young man start his aviation training now. With many veterans being graduated from colleges, universities and technical schools during the next few years, it means that every day he delays, the competition becomes greater. The sooner he is established in aviation, the better are his chances to obtain aviation's top positions and highest salaries. For it is only natural that these choice positions will go to the well-trained young men *who get in first.* If you start your training now, you will be in a responsible position in aviation at a time when your friends are barely starting their education.

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Time, of course, is all-important. This unusual situation can't last much longer. Soon, California Flyers—like other major aviation schools—will be enrolled to capacity. Young men anxious to take advantage of this welcome opportunity must act fast.

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ice shortly after take-off and stayed inoperative for nearly all the remainder of the flight. The triangular course, however, was flown at 2,400 r.p.m. (normal cruise) and at 2,650 feet above sea level.

Maneuverability in the air is excellent. You can even do the kind of sloppy uncoordinated flying Mr. Piper says should be permissible, and the *Super Cruiser* takes it as a matter of course. I made steep turns with and without rudder, and am convinced that the average "*Cub* pilot"—a term that is commonly used to describe any inexperienced pilot who can barely get the most elementary lightplane off the ground and back down again safely—will have little trouble checking out in this airplane. Once he does, he can feel quite comfortable in the knowledge that this larger, faster airplane is honestly not over his head.

The *Super Cruiser* handles well on the ground. It has a steerable tail wheel that seems to require very little use of the brakes while taxiing. The brakes are heel brakes, and I've yet to fly any airplane that had heel brakes on which I felt I could rely. My feet are pretty big (size 12) and I had all I could do to steer the airplane on the ground and try to use the brakes at the same time. I finally came to the same conclusion I had arrived at while trying to figure out heel brakes on other airplanes: leave them alone until you have plenty of time to fumble around on the floor without inadvertently kicking the steerable tail wheel at the wrong time.

On the subject of my feet in the *Super Cruiser,* one other point attracted my attention. There are two fuel tank valve handles on the left cabin wall down near the floor and near the pilot's left foot. I found it quite easy to "accidentally" move one of the valves just while sliding my feet onto or off the rudder pedals.

Visibility is good, both in the air and on the ground. While taxiing, I was able to see ahead over the nose quite well just by hanging on to a strut that crosses the windshield and pulling myself out of the seat slightly. In the air, the nose sits low in level flight, giving as good visibility as a pilot can expect from a high-wing monoplane.

The elevator trim tab is very much the same as that on the trainer. It is on the left side of the fuselage, just about at the level of the pilot's hand. It can be reached easily from the rear seat, too. Just a few turns of the crank handles gives quick, positive response; I found this airplane very easy to trim for hands-off flight.

It should be clear from the foregoing that Mr. Piper has achieved no aerodynamic revolution with the *Super Cruiser.* What he *has* done has been to produce just about as much airplane per dollar as you'll find on the market. Here is a three-place airplane with all the standard instruments, battery, starter, generator, muffler, navigation and instrument panel lights, dual controls—and a two-way Hallicrafters radio, also standard equipment —all for $3,295. And when you remember that this airplane will carry three people, 41 pounds of baggage and cruise at a good 105 m.p.h. for a range of 600 miles, well, you've got as good a deal as you'll find today.

The *Super Cruiser* is certificated in two categories; utility and normal. It also is licensed with either wheels, floats or skis.

Piper is turning out 30 *Super Cruisers* a day now. They're all being built at Lock Haven; all trainer production has been moved to Piper's new plant at Ponca City, Okla., where the present J-3 (pardon, *Cub Special*), and a new counterpart now in the works, will be produced. Piper, incidentally, is one of the very few personal plane manufacturers today who still has enough customers to support a production rate of 30 *Super Cruisers* a day. What better proof that this airplane is a good buy? —MAX KARANT

Home of 'The Impossible'

(*Continued from page* 34)

pulsion system may be actuated by automatic electronic circuits in the missile itself, or remotely. By telemetering back to the control station various data such as pressure, temperature, jet and missile velocities, it may be possible to control the propulsion system very effectively, thereby realizing the most economical fuel consumption for long range flight.

Facilities are also proposed to study the infra red part of the spectrum which may be used in detecting missiles traveling at supersonic speeds, since the surface temperature probably will be higher than that of the surrounding atmosphere due to air friction on the missile. Television and radar may be used for pinpoint bombing with guided missiles. Long range television and radar may be used for observing the movements of troop or cargo units.

For these investigations complete laboratory and office facilities would be provided with the most up-to-date equipment including adequate sound-proofing, dust, temperature and humidity control. There should be rooms shielded from the earth's magnetic field for special magnetic and wave phenomena studies. Other rooms would be specially constructed for reduction of sound vibration. A special radio and wave phenomena range representing various types of terrain would be provided for tests on transmission, reception, atmospheric disturbance and other radio-electronic characteristics.

Personnel protection is another vast field to be explored. Pilots must be protected to tolerate tremendous accelerations. Pilot fatigue, which will be increased many times at great altitude, must be measured. The greater difficulty of getting free of the craft in case of emergency is another problem. So is the effect of new materials, fuels, odor, extreme heat, cold and altitude on the human system.

While the development center is primarily intended to serve military aviation, AAF experts say they plan to release all developments which would promote the commercial interests and welfare of the American people. END

Wheel-Chair Aces

(*Continued from page 46*)

coupe sold the plane to the club without profit. Grand Central Airport Corp. guaranteed at least a year of free hangarspace and maintenance for it. Flight instructors at the field, most of them former Army and Navy pilots, volunteered their time to teach the fellows to fly. That's how 15 wheel-chairs were given wings.

Now almost every day, when the weather is good and there are no conflicting medical appointments, those veterans visit the flight line. They sit and talk about aviation and airplanes; they study the operation of their own plane and discuss its merits. They wait patiently until an instructor can find time to take one of them for a flight—or they fly with a buddy when he goes up. Spiritually, mentally, they fly all the time.

After that initial bit of help, the club now is trying to achieve self-sufficiency. Veterans pay a $5 initiation fee and each hour in the air costs them $2.50. The money goes to buy fuel and maps and to help pay for a radio and other equipment. Arrangements are being made with CAA for one of the members (a former Army pilot) to obtain an instructor's rating. That will give club members more flight time and relieve busy flight instructors at the airport.

Already the club is trying to wheedle its own landing strip near the hospital. Arrangements with officials at the hospital may result in grading a site not far from their ward. And there's talk that a quonset hut may be obtained which will serve as a classroom and hangar.

For the present, the club meets for ground school every Wednesday night in the paraplegic gymnasium. There members learn about the theory of flight, memorize Civil Air Regulations, study weather and navigation, and cram themselves full of other incidental knowledge such as map-reading techniques and radio procedures. Instructors say they have never lectured to a more receptive class.

One of the group who has freed himself from the confines of a wheelchair is Edward L. Gordon of La Mesa, Tex.

Ed was a B-17 pilot in the 96th Bomb Group of the 8th Air Force. On his 24th mission over Germany his plane was smashed by antiaircraft fire. Flak tore through his right side and gouged out a section of his backbone, severing the nerve cords leading to the lower part of his body. His wings were clipped, his flying over—so he and his doctors thought.

But recently Ed Gordon flew the *Ercoupe* for the first time —took off, practiced air work, brought her in and set her down on the runway. If he seemed a bit dazed, it was only because he was trying to realize that a wheel chair future was off to a flying start. END

Lightplane Landings—By Bombsight

(*Continued from page 42*)

Flint's only explanation of the internal workings of his gadget is that it employs electrical and optical means to give the hypotenuse of a right angle triangle, or the correct glide path of the plane. The other sides of the triangle are the imaginary line from plane to earth and one along the ground from that point to the spot where a landing glide would end. Most of the top side of the instrument is taken up by a large lens. Slanting above the top, forward from the back at near 45° is a sheet of plastic through which the light ray is bent.

Commenting on the device, Leon Wolfe, chief of Aeronca research, said "the instrument will eliminate human error in landing and remove the mental hazard connected with landing in a limited space."

It's also a handy little thing to have around if you are uncertain whether your plane will clear some obstruction. By simple adjustment, after you are in a glide, you can flip the dot on the obstruction. If it stays there, you're going to hit it; if it races forward, you'll clear it; if it backs up, you're going to land in front of it.

Or, if your engine conks out and you'd like to know in half a minute whether you have enough stuff to reach a landing space, another simple adjustment gives you the straight dope in plenty of time to pick out the best spot to set down on.

It's the next thing to lightplane radar! END

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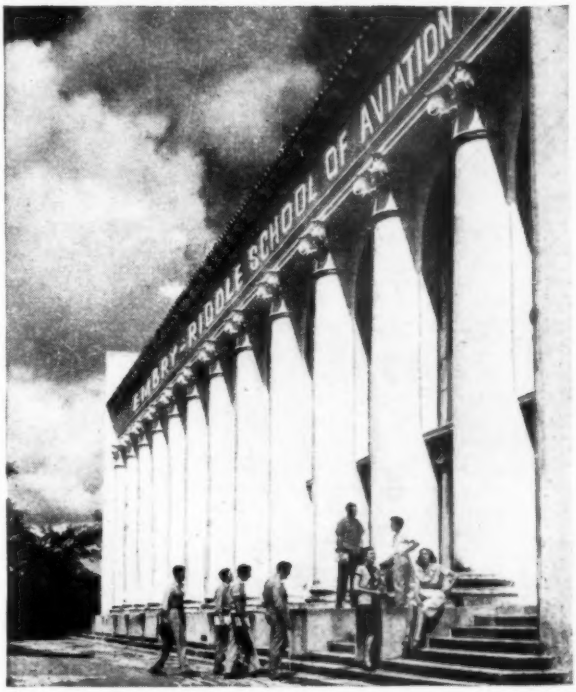

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"But why is this license angle so important, old boy?"

"CAA regulations require that the periodic inspection given all aircraft be approved by licensed mechanics, Jim."

"Sounds like a good deal, chum . . . I'm thinking I'll prepare to enter aviation at Roosevelt too."

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Letters

(Continued from page 6)

proper for mountain flying any more than it is proper for sea level flying. Stall danger at high altitudes is no different than stall danger at low altitudes.

Pilots who hearken to this caption will come up to Reno, or Tahoe, or Afton, Wyo., and shooting at a short rough field will come in fast with power to minimize stall danger and land in a tree.

Take for example, my *Ercoupe* which stalls out at an indicated air speed of 45 m.p.h. at Chicago near the lake. It likewise stalls out at an indicated air speed of 45 m.p.h. at Afton, Wyo., elevation 6,300 feet. It is true that when my wheels touch the ground I have greater ground speed than in Chicago and, technically, a higher true air speed, but if I make an Afton approach at 60 and flare out low for landing I am in just as great danger as though I were at sea level. Actually I am showing the same indicated air speed on the glide at my elevation.

The mere fact that ground speeds are naturally higher adds a certain amount of danger on short rough fields. The landing jolt and landing run is going to be harder and farther than a sea-level landing run. That in itself will demonstrate, I am sure, the fallacy of this "power-on" landing technique.

This doesn't by any means condemn the article as a whole—I thought it good. The topic is one that still hasn't enough publicity, but this one phase of the subject is the very one that most people are confused about.

BOB ARENTZ
Ogden, Utah

END

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I Learned About . . .

(*Continued from page 60*)

know how to fly, and I think that even today he doesn't realize what a spot we were in.

Possibly we were drifting far out over the Pacific. Maybe we had flown too far east and were out over the Caribbean. I wasn't sure of anything because I had not checked our time above the clouds closely nor our direction. I had not realized that we would be caught above the clouds without a glimpse through to tell whether we were over land or water. I did know that it would be futile to try to turn back and attempt to find the place where we first came up.

There was nothing to do except hope for a break in the clouds so that we could get down again. Knowing the weather in the tropics, we couldn't guess how far the clouds were spread out. For the first time I really thought I was a goner.

After a long silence between my companion and myself, I said, "Well, what do you think?" Apparently he wasn't bothered. He answered, "Just keep on going."

Finally, with a little over an hour's gas left, and realizing that we might be far out over water, I decided that I might as well try to glide through that rough sea of white below and take a chance on the consequences. I was going to allow five more minutes before making the attempt. I knew that after only a minute in the overcast I would lose all sense of direction and begin to spin.

Then the miracle happened. We had turned southward for the five minute run, hoping that it would put us over water when we came through. Before the five minutes had passed, we had our first glimpse of the ground as we passed over a narrow crack in the clouds. Just beyond was another opening large enough for a *Flying Fortress* to spiral through; and to top it off, a native village directly below!

I kicked the plane into a tight spiral and dropped down to 500 feet from 8,000 feet. At first we thought the village was Chepo, between Panama City and the region we had hoped to explore, but after glancing at the compass and the coast line, I knew it wasn't Chepo.

I set the plane down in a pasture and in my limited Spanish I asked a native at his mud and grass hut what his town was called. The native told me that it was Chorrera, about 15 to 25 miles west of Panama City and the Canal Zone. We took off and in a few minutes had reached Paitilla Field at Panama City, thanking our lucky stars for that break in the clouds.

While we were lost above the clouds we apparently traveled about 150 miles up the Isthmus in a path that might have taken us out over the Caribbean, then northwestward, then south, then back over the isthmus. This is only my conclusion —I couldn't prove any of it.

Let other lightplane pilots take note. If you don't have an instrument ticket, stay under the overcast. You may not be as lucky as I was! END

London Letter

(*Continued from page 59*)

ordinary title of the "Cumulo-Nimbus Committee." One of the first acts of the committee was to consider a project for aircraft radar equipment which would enable crews to detect at long range the position of cumulo-nimbus clouds.

In the past clouds have not often been charged with being a primary cause of air accidents; yet Royal Air Force pilots doing the transport run from England to the East will go a long way to avoid some kinds of cloud formation.

The Cumulo-Nimbus Committee is under the chairmanship of Air Ministry Director General of Training, Sir Basil Embry, a renowned night-fighter pilot in World War II.

There is also an Air Safety Committee, formed by Lord Nathan, present Minister of Civil Aviation, under Sir Frederick Bowhill, with Lord Brabazon as one of its members, and a committee on private flying.

Lord Nathan has affirmed his intention of giving safety in flying priority over all other considerations partly because of nervousness toward air travel (which may not be statistically justifiable) shown by the public following recent serious accidents in various parts of the world. END

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Report from Washington

(*Continued from page 51*)

were organized a month had acquired a couple of Link trainers and four planes. Even the $10 initiation fee in the outfit immediately goes toward making jobs. The man bringing in a new member is awarded some flight time and rental of the plane is paid out of the initiation. Airvets are now hoping to extend their organization clear across the country and meantime are making Bellflower a model airport for service and low fees.

Ohio Court Decision

Fixed-base operators are jittery over a recent Ohio Court decision in which Judge Stephen C. Colopy (Summit County Court of Common Pleas) ruled that planes are trespassing when flown below CAA minimum altitudes for flight over "congested areas." Operators say that the ruling—a basis for Judge Colopy's injunction against operations from two private flying fields near Akron—sets a precedent that "will prevent construction of any but large, publicity-owned airports." Even though flights over property adjacent to airports do not disturb residents, the ruling does give ground for similar restraining injunctions in similar cases.

Slide rules in hand, operators pointed out that at a glide angle ratio of 1 to 7, airport boundaries would have to be 3,500 feet from the ends of runways. And if CAA "clearance" recommendations for Class 1 Airports which allow a glide ratio of 1 to 20 were followed, a glide range of 10,000 feet would be required at each end of runways. With 3,500-foot runways, a total distance of 23,500 feet would be needed within airport areas. That means an airport site containing 16 square miles. In any event, most light planes would require the better part of a mile to reach a 500-foot altitude after take-off.

Operators of the two ports in question —Chamberlain and Stony Hill—will carry the case through the higher courts. But similar court decisions have been based on the altitude minimums prescribed by CAA for safety alone. And, while this "converts a governmental safety regulation . . . into . . . a law governing the private ownership of property," it appears that the only solution is for CAA to change the minimums or to redefine the term "congested areas."

Air Traffic Control

While debates continue on what's good and bad about the Civil Aeronautics Administration air traffic control system, we pause to relay an inside story of how it worked during the last leg of the historic flight of the Navy's *Truculent Turtle*. The story, not told until now, comes to us from Comdr. Ralph F. Yambert, Navy PRO at the air station at Glenview, Ill. Yambert, besieged by half a hundred newspapermen at his field, got word that the *Turtle* was running short of gas and would sit down at Des Moines, Ia. "Through VHF equipment at Glenview, I tried to establish radio contact with the *Turtle*," Yambert relates, "but was unsuccessful. So I flicked down the key of the CAA communication box in station operations office and asked Chicago ATC to call through the station nearest its last reported position. Not more than five minutes later we were told that contact had been established, and in a few minutes Grand Island, Nebr.'s CAA station, relayed a position report from the *Turtle* and followed with the information that the plane had 430 gallons of fuel remaining in its tanks. Quick calculations on our part seemed to indicate that this would take the plane beyond Des Moines—probably right into Glenview. But further checks from CAA finally revealed that the *Turtle* was heading for Columbus—information received in ample time by Commander Yambert to fly the newsmen to the landing. "The story of the *Turtle's* landing is now history," Yambert adds, "but the record should include the part played by the CAA's air traffic control in helping the press to be on hand when the plane landed." END

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AERONCA K. 650 Hours Total. 65 since Major and Magnaflux. Relicensed in June. Always hangared. Excellent condition. Steerable Tailwheel, $825 or Swap for good licensed Biplane. Fred McFeeters, Box 481, Albany, N. Y.

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ONE 1946 Aeronca Champion demonstrator, $1800.00. Flying and Auto Service, Inc., Portland, Ind. Phone 16F40.

AERONCA Champion, new April 12, 1946. Always hangared, never cracked. Excellent condition as it has been operated by an A&E mechanic. New 100 hr. check. First $1950 takes it. H. E. Stevenson, Globe, Ariz.

LATE 1940 Aeronca Chief. 65 H.P. Lycoming, 66 hrs. since topped. Wings recovered Feb. Body recovered and relicensed July. New Lucite windshield. $1295. James Word, Box 747, Phillips, Tex.

1946 AERONCA Champion, 125 hours, Airbay receiver and permanent antenna installed, always hangared, privately owned, never used as trainer. $2250. C. A. Benscoter, 405 Columbia, Ithaca, N. Y.

AERONCA TAF, Wings covered, engine topped, relicensed Oct. 1946. 5 hours since repairs, $460. (Not cracked) Must be sold. Owner working out of country. Best offer takes. Bob Morris, 1220-24th Ave., Meridian, Miss.

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AERONCA 058B, 1942, C6S, 200 hours since engine major, one piece windshield. Good fabric, $1350. Write or call Rollin Caler, 115 N. Gillette, Tulsa, Okla. Phone 20302.

1946 AERONCA Chief. Privately owned. 42 hours. $2500. Dr. H. B. Shafer, Anna, Illinois.

AERONCA Chief 1939. 700 Hours. 10 hours since wings recovered, relicensing. Cruises 80. Cont. 50. Excellent throughout. Sacrifice for $1195. Charles Nearing, Holcomb, New York.

AERONCA Super Chief 1940. 65 Continental, radio, new tires, air scoop, auxiliary tank, fabric like new, wheel pants, engine perfect, actually one of the cleanest ships in this territory. $2095.00. C. O. Fiers, 2824 Wabash Ave., Terre Haute, Ind.

BEECH

BEECHCRAFT negative stagger biplanes. Like brand new. New fabric, very clean. Fast, economical airplanes. I. J. Enger, 324 North 1st St., Minneapolis, Minn. Phone AT 1281, Eve. BR 3291.

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TWIN Engine Beechcraft, 1946 model, seven passenger deluxe. Five reclining luxury seats, excellent for executive use. Total time 46 hours. Write or call John P. Cissel, Atlantic Aircraft Distributors, Inc., Baltimore Municipal Airport, Balto, 22, Md. Riverside 1522.

CHARTER operators here is a plane you can operate profitably. Beech E17B, 285 Jacobs (L-5). Licensed 5 place day, night, instruments. Cruises an honest 150 at 15 gallons per hour with 4 passengers and baggage. Just re-upholstered and re-finished; always hangared. Airplane total 580, engine total 680, 60 since major. A beautiful plane; now flying on charter trips. Will deliver to you for your inspection for expenses. $16,000.00. Cee Gee Air Service, Box 491, Casa Grande, Ariz.

BOEING

BOEING PT-17: Silver finish. Just relicensed, wing recovered. Engine 125 hours since major. Excellent condition $1650. R. Stevenson, 34 Eastwood Circuit, West Roxbury, Mass.

CESSNA

CESSNA 140, new, August 31, 1946, total time 80 hours, starter and generator, G. E. radio and speaker, electric turn and bank, sensitive altimeter, 8 day clock, Grimes landing light, dual toe brakes, heater. Cost $3786, will sell for $3250. Reason for selling, buying larger plane. C. C. Stephens, Phone LD-4, Shawnee, Okla.

LOOK—We have 4 Twin Cessnas; all unmodified, But—all have 5700 lb. wing design, complete blind flying instruments and 2-way radio (transmitters require change of crystals only), Seats for 5 (no cushions). Can all be licensed 5 place without any structural modifications. All good engines, 2 have new tires, good wooden props included, will cruise 145 with these. Cessna NC license kits included with each. Only shortages: all clocks and head-phones. We will Ferry these anywhere in U. S. for $3,000 each. Operators. Call or wire for special deal on all 4 delivered to you at your field. Orville E. Stockwell, Stockwell Motor Co., Greybull, Wyoming.

CESSNA UC-78: $6950. 623 hours total time, aircraft and engines. No time since complete overhaul and recover of airplane. Auxiliary gas tank, baggage door, radio in nose, battery under co-pilot seat. Augusta School of Aviation, Augusta, Ga. Phone 2-3465.

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CULVER

LFA, 1942, total time 406 hours, 50 hours since factory check. Painted yellow with Stinson green trim. Reasonably priced. W. H. Ostenberg, III, Scottsbluff, Nebr.

CULVER 80 h.p. LFA. late '41, just recovered, relicensed, and painted blue and cream. 15 hrs. since major. Radio transmitter and receiver, landing and navigation lights. Licensed for night flying. Cruises 125. Always hangared. Ship is like new and ready to fly away. $2450. N. P. Dodge, Jr., 5014 Capitol Ave., Omaha, Nebr.

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CULVER Cadet, 1941. Total time 340 hours. Two-way radio, hand rubbed finish, always hangared, panel completely filled, all airline instruments. Cruises 120. Finest Cadet on west coast, a deluxe plane for the sportsman pilot. Reasonably priced. Ralph Yeomans, 1226 Chester Place, Bakersfield, Calif., Phone 34736.

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DART 1946. 100 hp Continental engine. Cruises 120, tops 140 mph. Unequaled for X-C or aerobatics. 100 hours total time. $3500. Brown Deer Airport, Milwaukee 9, Wis.

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ERCOUPE 1946, 40 hours, no reasonable offer refused. Dr. Lerner, 119 S. 13th St., Phila., Pa., Phone Pe 5-1673 10 A.M. to 3 P.M.

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ERCOUPE 415-C; 1946 with 94 hours, perfect condition, starter, green visor, two-way Bassett radio. Price $3200.00. John J. Smith, 1111 W. Washington, Jackson, Mich.

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FAIRCHILD

FAIRCHILD PT-26. Excellent condition, inter-com. Complete with hatch, lights, two sets of complete instruments for blind flying. 275 hrs. total time since new on motor and aircraft. $2400. Albion Airport, S. Main, Albion, N. Y.

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GLOBE SWIFT, 125 H.P., Model GCIB, NC78000, total time 67 hours. Used as demonstrator only by owner. Must sell. Need money for hangar. If interested, make offer. First satisfactory offer will be accepted. Schlosser Flying Service, Durand, Wis.

GLOBE Swift, 85 h.p. Continental, 130 hrs. total, condition perfect, privately owned. Koppers Aeromatic propeller, GE two-way radio, blue leather upholstery. A beautiful ship. Will deliver for expenses. $3500. Ford King, 654 Madison Ave., New York, N. Y.

INTERSTATE

1941 INTERSTATE S1A. 65HP Continental: Recent complete major both airplane and engine. New fabric, plexiglas, prop, brakes, tires, cushions and upholstery. 75HP pistons and valves. Cruises 95. $1550 or trade for new auto. John Kennedy, 813 North Wellesley Ave., Albuquerque, New Mexico.

HOWARD

HOWARD, DGA-15P, 5-place. Only 197 hours since engine major and recover. Just repainted with hand-rubbed red finish with cream stripe. Cruising speed 192 m.p.h. Powered with 450 h.p. P.&W. motor with Hamilton standard constant speed prop. Wheel pants, spinner, Army Command receiver, 50-watt transmitter beacon receiver, Lux engine fire extinguisher, complete blind flying group including directional gyro and artificial horizon. This airplane in perfect condition. Exceptionally good interior. Will deliver. Accepting best offer. Write: Paul T. Machner, 464 Raleigh Ave., Hampton, Va.

PT-23 HOWARD built, fabric covered wings. 1944. Total time A&E 246 hours. Silver & blue. Cruises 110 at 1800. Rawdon hatch with sun guard cover. Electric inter-com. Ship never damaged. Fine condition and will deliver 300 miles free. $1850. First $100 holds. Leo L. Strickler, Luray, Va.

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HOWARD DGA-15P Pratt and Whitney 450 hp, 626 total hours, 14 since major overhaul of engine and airplane with all new fabric, 9 hours since major on constant speed propeller. Three radio receivers, 30 watt 3105 and 24 watt 6210 transmitters. 136 gallons gasoline. Blue leather upholstery, five place, hand rubbed insignia blue finish tastefully trimmed. Licensed for night and instrument operation with new annual inspection and ready for immediate delivery December 10th. Write, wire, or phone 641-J. Hoffer's Flying Service, Woodward Field, Camden, S. C.

PT-23 LICENSED, completely. 25 Hrs. since Army O.H. 162 total on engine, new prop., sacrifice $1100. 550 Hrs. on aircraft. Fabric covered wings, V. D. Gannon, 5230 Columbia Ave., Philadelphia, Pa., Phone GR-7-1450.

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LUSCOMBE 8-A, ferry time only. NC71953. Heater included. Best offer over $2500 takes it. Take car in trade. Anderson Charter & Flying Service Inc., Box 42, Lapel, Ind.

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MONOCOUPE: Warner 150 Total time 645 hours, 38 since major, Spline Shaft. Starter. Just completely recovered Cream with red sunburst handrubbed. Receiver, Transmitter. Cruises 140 MPH. Price to sell $2750. George Bost, East Columbia Ave., College Park, Ga.

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NAVY N3N3 in excellent condition. Engine Wright R-760-8 has 465 hours total time. Metal prop. Excellent instruments, balloon tires. Have extra engine R-760-8 same as in plane. Sell both together for $1800 cash. Write C. C. C. Clement, N.A.S., Olathe, Kansas.

N3N3 LICENSED NC45106 always hangared, only 78 hrs. on 235 H.P. Wright engine since factory major overhaul. A good buy for $1450 or trade for Ercoupe. Harold Pabst, 237 W. Maple Ave., Bound Brook, N. J.

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NOORDUYN Norseman. Licensed; only 29 hours on engine since major overhaul; 340 hours total hull time. New paint job. Complete, with radio compass. $9500.00. P. O. Box 892, Baton Rouge, La.

NORTH AMERICAN

NORTH American AT-6: 180 hours since first overhaul on engine and 140 hours since overhaul of airplane. Licensed August 1946. $1650. Augusta School of Aviation, Augusta, Georgia. Phone 2-3465.

SNJ-3 NC66238, 1345 total, 237 since major on airplane, 706 total on engine with 240 since first major. Jam up good and clean all around with 3105 crystal radio, clock, new lights, nite and instrument airworthiness. Beautiful silver with deep blue trim. First $300 deposit gets it, balance of $1450.00 on delivery. Write, wire or phone 641-J. Hoffer's Flying Service, Camden, S. C.

SNJ-4 NC55767 35 hours since first engine overhaul complete with two instrument panels, two way radio, etc. Tires and control surface fabric in perfect condition. $2400. J. M. Supple, 500 Camp Street, New Orleans, La.

SNJ-3 TEXAN, full dual instruments (less clocks). 1305 kc radio, lights, polished alclad finish. A-1 condition, 250 hrs. since major, none since 100 hr. check. NC66241, $2390.00. Don Kuntz, 265 S. Yale Ave., Columbus 8, Ohio.

PIPER

PIPER Cub Trainer-J3F65. Relicensed July. Excellent condition—175 Hours since Major, $1175. Owners purchasing faster ship. The Aviairs, Inc., 55 Wagaraw Blvd., Paterson 2, N. J.

PIPER J4A Coupe 1940 Deluxe C65 Navigation lights, wheel pants. RCA transmitter and receiver, sensitive altimeter, fixed and trailing antenna, battery and generator. A really complete airplane. $1900. S. S. Starr, 53 E. 24th St., Chester, Pa.

CUB J4E, Cont. 75, 7 hours since relicensed, 196 hours since major on engine. Has sensitive altimeter, two way radio, generator, battery, position and landing lights, clock, brakes, steerable tail-wheel. Never cracked. Priced $1500.00. Contact Floyd Walker, Jennings, La.

PIPER Super Cruiser. Manufactured 1945. Ship has less than 200 hrs. total time. Nicely upholstered, beautiful hand-rubbed finish, Navigation, radio, pants, Cruises 110 M.P.H. on 6 gallons. To see and fly this plane will be to buy it. Sacrifice for $2650. Call or wire J. B. Threadgill, Hartford City, Indiana.

CUB J3-F50. Good as new. Licensed till Oct. 1947. New fabric, two tone finish. New shock cords. Plexiglas windshield. All new pyralin, Steerable tail wheel, Dual brakes, engine overhauled, valves reground, new rings, new bearings and factory shot blasted reconditioned crankshaft. A bargain at $1350. Albatross Flying Club, 1828 Morgantown Ave., Fairmont, W. Va.

J5 CUB Cruiser-Continental 75-NC38877. Manufactured 1940. Approximately 1100 hours total. 175 hours since engine major and aircraft work performed. New windshield. New upholstery. 25 gallons gas. Shows 80-85 Cruising. Performance Excellent. $1850. Hampton Aircraft. 3303 S. Kingshighway, St. Louis 9, Mo.

PIPER J3C, 65 H.P. 1941. Lights, battery, nice appearance. Good trainer $1250. Write or call Rollin Caler, 115 North Gillette, Tulsa, Okla. Phone 20302.

PIPER Cub J3C, Cont. 65 h.p. NC2170M. Brown upholstered seats. Built Nov. 6, 1946. Only 25 hours. $2200.00. Milo C. Lehman, 618 High St., Berne, Ind.

PIPER J3F-65 1941. Extra Compass. Sensitive altimeter. 8 Day clock, skis, new extra prop. Owner needs bigger ship. $1300.00. Joe E. Meehan, 131 G St., S. Boston, Mass.

PIPER J3, 1946, Continental 65, 150 hrs. total time since new. $1800, for quick sale. Albion Airport, S. Maine, Albion, N. Y.

65 HP PIPER Cub J3-L. Like new, brakes, navigation lights and skis. Perfect condition $1200.00. Will deliver for expenses. Deposit will hold for inspection. Hilton Flying Service, Hilton, N. Y.

PIPER—New seaplane, without Wollam floats but with land gear. $2060.00; with floats $2800.00. John A. Cosgrove, 36 Richmond Terrace, Staten Island, N. Y.

CRUISER 75 hp Continental 1216 total hours, 2 since new fabric and annual inspection in October. Engine 994 with 74 since major overhaul. Reconditioned propeller. Metallic blue with red trim. Sensitive altimeter. Deliver anywhere for expenses. Write, wire or phone 641-J. Hoffer's Flying Service, Camden, S. C.

PIPER J5. Handrubbed finish. Clean ship. Wheel pants and strut cuffs. 967 hours on ship, 210 hours on engine since major. Fresh periodic. $2150. Brown Deer Airport, Milwaukee 9, Wis.

PIPER J4 Coupe, latest pre-war model, blue and cream, 75 hp Continental, 650 hours total time, 370 since major. Best offer. Penn-Harris Airport, Harrisburg, Pa.

1941 CUB J3, 65 hp. Lights, brakes. $1000. Conway Valley Airport, Conway, N. H.

CUB Coupe—All accessories, including two-way radio. Relicensed. Excellent condition. Must sell immediately. $1545. Box 2485, Charlotte, N. C., Phone 4-6439.

J3L, 65 Lycoming engine, 1 piece windshield, dual brakes and ignition, air scoop, full swivel steerable tail wheel, new prop, $1295.00. Waverly Flying Service, Waverly, Virginia. Phone 44-R.

PIPER Cub J3L, 50 h.p., brakes relicensed, price $995.00. H. Wiley, Box 221, Kenton, O.

1946 J3C-65 PIPER Trainer, NC70406. Total time 62 hours. Hangared since delivery May 18th, never damaged. Price $1800. Flyaway Field, Northern Aviation Co., Indian River, Mich. Phone 621.

REARWIN

REARWIN Cloudster, Instrument Trainer 8135T, 120 Ken-Royce. Built 1942. Low Time. 22 hours since overhaul. Gyro horizon, directional gyro, and all other flight and engine instruments. Generator. Trail and fixed antennae. Newly finished. Maintained by Pan American Airways. Cruises 120. Inexpensive to operate. Just the instrument trainer for a G. I. Program. Price $1,950. The Coogan Company, 8440 Sunset Blvd., Hollywood 46, Calif.

RYAN

RYAN—240 Hours on Kinner 56. New Prop-relicense pending sale. Cuson-Kinghorn, c/o 3353 Sunnyvale Dr., San Diego 2, Cal.

RYAN PT-22: $1650. No time since overhaul on engine and relicensing of airplane. Augusta School of Aviation, Augusta, Georgia. Phone 2-3465.

TWO Ryans (PT-22's). Excellent condition, low engine time, both relicensed recently. One equipped 2 way radio and blind flying group at $1,800. The other ship priced $1,700. 3511 S.W. 25th St., Miami, Fla.

RYAN, Beautiful PT-22, 160 H.P. Kinner engine cruise actual 110 m.p.h. engine has 270 total hrs. No hrs. since major with all bulletins complied licensed to July, 1947. Complete instruments and radio. This plane practically new. I need cash so make an offer—but hurry. 3952 St. Clair, Detroit 14, Mich. Phone Murray 4206.

SILVAIRE

1946 SILVAIRE Cont. 85. Model 8E. Navigation and landing lights, starter, pants, 20 hours, total, all metal, private ship. $3,550.00. Owner buying larger ship. Floyd Johnson, R2, Marshfield, Wis. Phone 413 Lindsey.

STEARMAN

STEARMAN PT-17 NC 61871, licensed, Cont. 220, metal prop, good condition, highest offer takes it. Menomonie Air Service, Menomonie, Wis.

STEARMAN, Navy N2S-3, Continental 220, Boeing built April 1943, standard instruments including bank and turn in both cockpits, navigation lights, CO2 fire extinguisher locking tail wheel, and McCauley steel prop. Aircraft and Engine have 330 hrs. since Naval Air Station recover and overhaul May 1945. NCed November 1946, has AN orange finish, a very complete and clean Stearman without the cost of a fancy trim or paint job. Priced $1195, or with 2 Irvin 'chutes $1295. Will deliver the first 500 miles free. Carlisle A. Jacobsen, Bks. 10, Spartan School of Aero, Tulsa, Okla.

STEARMAN, N2S-3, Continental 220. Built June 1943, Engine, Airframe, Majored and recovered by Navy Sept. 1945. 375 Hrs. since major. Fabric and wood excellent. Standard instruments including bank and turn in both cockpits. Tires good. McCauley steel prop. Licensed until Nov. 1947. Plane now hangared. Will deliver the first 400 miles free. Price including two seat type parachutes, $1075. cash. Or will trade for good clean auto. All inquiries promptly answered. Forest E. Rippee, Spartan School of Aeronautics, Barracks #10, Tulsa, Okla.

PT-17. Only 168 hours since engine overhaul. Just relicensed and refinished in red dope and silver. New wood propeller and hub. Spars inspected. Believe it to be cleanest Stearman in country. Price $950.00. Coogan Company, 8440 Sunset Blvd., Hollywood 46, Calif.

STEARMAN, excellent condition, just licensed, low time on engine and Aircraft. Has steel prop. This is a beauty. Will trade for car, heavier unlicensed aircraft, or cash. What have you? Vernon Duwe, 4132 North 58th St., Lincoln, Nebr.

STEARMAN N2S3: NC9501H. 580 since new on 220 Cont. NC9513H, 119 since major on 220 Cont. with canopy. Fabric on both excellent. Choice for $1400.00. Wes. Wieland, Beloit, Wisconsin. Phone 9955R14.

STEARMAN, relicensed August, '46. Low engine time, steel prop, extra equipment. $1,000.00. E. Lawrence, 125 Chestnut St., Cambridge, Mass. Will deliver.

STINSON

STINSON HW-75. New fabric, maroon and white trim, new upholstery, Plexiglas windshield, blind flying instruments, motor checked. For further details write: Casey Jones Flying Service, Ontario, Ore. $2600.00.

STINSON AT-19, Gull wing Reliant type. New airplane reassembled from original export crate and completely converted to beautiful 5-place civilian plane. Fully sound-proofed, upholstered interior. General Electric radio transmitter and receiver with speaker. Complete blind instruments. Total 11 hours on aircraft engine and propeller. $6445.00. Standard Air Service, Glen Burnie, Md.

STINSON SR-10J: Just relicensed. 1185:00 total time, never on program. New Lycoming 295 horse power, 106:00 since new with Hamilton constant speed prop. 3-place, full blind flight group with new Sperry gyro, transmitter, receiver, manual loop by RCA. Lux engine extinguisher, flares, landing lights, new tires. Most beautiful clean ship of this type in country. Must be seen to be appreciated. Licensed day and night instrument. $10,500. Will accept trade. Hempel, Box 41, Lambert Field, Mo.

STINSON AT-19. Complete with upholstery kit, including windows, seats, seatbelts, Airfoam cushions, etc. Unlicensed, $4000. Brown Deer Airport, Milwaukee 9, Wis.

STINSON SM8A. Just relicensed. Ready to go. 5 place. 215 Lycoming, $2450. I. J. Enger, 324 North 1st St., Minneapolis, Minn. Phone AT 1281, Eve. BR 3291.

STINSON 10 A Voyager, 1941 model. 90 h.p. Franklin engine just overhauled. Wings just recovered. Painted blue and red. Ready to go. Well equipped. $2995. A bargain. I. J. Enger, 324 North 1st St., Minneapolis, Minn. Phone AT 1281, Eve. BR 3291.

1946 VOYAGER 150. Delivered August 1946. Equipped with two-way radio, clock, turn and bank indicator, rate of climb indicator, and sensitive altimeter. Travis Cadillac Co., 1701 Main St., Peoria, Ill.

SR-10 TYPE completely recovered, new interior licensed 5 place, complete instruments, constant speed prop. 310 hours total, 67 since major. Lycoming 295, hand rubbed Tennessee red. For further information: Box 6, Plattsburg, N. Y.

STINSON Gullwing, 5 place, beautiful perfect ship. 25 hours total time, reasonable. Kurt Scheub, Crown Point Airport, Crown Point, Ind.

STINSON 105, only 650 total hours. 150 since major and magnifluxed. Cover and finish excellent. New tires. A real 3 place ship for only $2300.00. Julius Blair, Chatsworth, Ill.

L-5 "FLYING Jeep." New Grade A Fabric upholstered, low time engine, 10 hours on Airframe since majored. Just licensed. Ideal for Rancher or Farmer. $2500. Write or see Captain William A. Wood, 38th Cavalry Reconnaissance Squadron, Fort Knox, Ky.

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STINSON L-5 just licensed; perfect condition, 190 h.p. Lycoming engine, engine time 120 hours, five hours since major overhaul. Two-way radio; clock, needle and ball, generator and starter, 75 pound baggage compartment. Rear seat widened allowing room for two small people. Ship beautifully finished in maroon and cream, handrubbed. Price $3500. Lewis Westenskow, 8 Arsenal Way, Clearfield, Utah.

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1946 SWIFT, 1125 mph true, 85 h.p., retractable gear, VP-Prop., flaps, Inst. and Nav. lights, seat covers, GE-radio, clock, sens. alt., rate-of-climb, manifold press.; no "new plane bugs" in this ship, 5.4 gas consumption, 78 hours, will deliver immed. for return ticket and $4500. J. R. McDaniel, 1104 N.W. 1st St., Miami 36, Fla.

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TAYLORCRAFT BL-65, mfg. Nov. 1940. Total time 760 hours, 20 hours since engine major, red with black trim, very good condition. Highest offer. Harrisburg Air Service, Inc., Penn-Harris Airport, R.D. No. 1, Harrisburg, Penna. Phone 39458.

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TAYLORCRAFT 1946 Cont. 65, 80 hour total, like new, blue and silver. Private owned, always hangared, owner buying larger ship. $2000.00. Floyd Johnson, Marshfield, Wis. R. 2. Phone 413 Lindsey.

1946 TAYLORCRAFT Ace. Rate of climb, Radio receiver, Cabin heater, other extras. Cost $2314.00. 39 hours total time, sell for $1950. James Stargel, 246 Whitmoor Terrace, Silver Spring, Md.

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TAYLORCRAFT, L2M, total time 325. Wings recovered grade A 8/1/46, full swivel tail wheel, spoilers, excellent condition. Price $2000.00. J. C. Russell, M.D., Rogersville, Pa.

VULTEE

BT-13. $950.00. Very good buy. All instruments and radio, 200 hrs. since major. Conway Valley Airport, Conway, N. H.

BT-13A ALL metal. 10 hours since licensed. Airframe and engine perfect condition, exceptionally clean. $1650 or trade on new car. H. Junkermann, Sugar Grove, O.

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WACO UKC, 5 place: Continental 220 h.p. Relicensed in August 1946. $3950. Airplane completely overhauled and recovered January 1946. Engine 300 hours since factory overhaul. Augusta School of Aviation, Augusta, Georgia. Phone 2-3465.

WACO ZQC-6, 285 hp. Jacobs, two position Ham. prop. 5 place 100 lbs. baggage, blind flight group, two way radio with loop, wings just rebuilt and recovered and ship relicensed. This plane is in top condition throughout. Make offer, will take car in trade. Will deliver for expenses. Anderson Charter & Flying Service, Inc. Box 42, Lapel, Indiana.

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ERCOUPE 1946, 65 hours total, $3150.00. Aeronca Champion 1946, 50 hours total, $2250.00. 3 excellent J3 65 h.p. Cubs. All reconditioned, relicensed. Low hours, $1350.00. Accept good PT-17, Repairable Crack-ups or Automobile Trades. Financeable, Warrington Air Service, Airport, Warrington, Penna.

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AIRPLANES WANTED

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AUTOMATIC Radio Compass: Bendix ARN-7, in working condition. Asking $300. Not for light planes. Will fit See Bee. David Perry, 10 Mountain Ave., Maplewood, N. J.

WANTED: Menasco 95 H.P. Engine in A1 condition or base for inverted Mark III Cirrus. Bernard Morey, Brewerton, N. Y.

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FOR SALE: 1 Kinner R-5 engine, 160 H.P., No. 1 tapered shaft. 1 Hamilton propeller, like new, No. 1 tapered hub, 165 H.P., 1 Curtiss-Reed propeller, like new, No. 1 tapered hub; 160 H.P., 1 Hamilton propeller, tapered hub; 100 H.P. Inquire Earle S. Eckel, Box 42, Washington, N. J.

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EX-ARMY Senior Pilot, eleven years pilot experience, including R.C.A.F. Married, age thirty-two. Hold commercial license 235-40 with instructor, instrument, single and multi-engine rating. Over 4,100 accident free hours including 1,000 B29, 1,300 B17 and much C-47, C-45 time, with balance in almost all types including helicopter. I will consider any attractive offer, and answer all correspondence. If you can use a reliable, safe pilot with a long superior record since 1935, contact me at once. Available immediately. Just discharged 6 November, and post-war plans are fading, due to strikes and production delay. P.O. Box 2185, Cincinnati 1, Ohio.

EX-ARMY A.C. Liaison Pilot, commercial single flight instructor rating. Will have multi-engine soon. 1000 hours, want position as flight instructor. Age 33, good health, unmarried, adaptable, widely traveled, speaks foreign languages. Has passport ready, available on short notice, go anywhere, preferably South America. L. Varosio, 313 W. 55th St., New York City 19, N. Y.

PILOT position wanted with corporation or business. Perform additional duties. Perfect health. Age 26. Commercial instrument ratings, 3400 hours, 2800 multi-engine, over 50 types including B-29, C-54, P-80. Travel anywhere. Considerable experience cross country and flight testing. C. C. McCutcheon, 2810 N. Fitzhugh Ave., Dallas, Texas.

AIR Line Pilot, 11 yrs. experience, age 27, 4000 hrs., hold all CAA ratings, Former Naval Air Transport Pilot. Desires position as company pilot on multi or four engine equipment. Will answer all offers. Box 8167, Kansas City, Mo.

HELICOPTER Pilot with scheduled run experience. Interested in test, experimental, or foreign offers. Everything considered. State salary. Box 475, % FLYING.

EX-ARMY Pilot desires flying position. Single. Age 22, Day, Night, Instrument, X-C experience, Single, Multi-Engine 1100 hours, 800 in C-46 & C-47. Commercial License Instructor Rating, go anywhere. Box 476, % FLYING.

HAVE Airline Transport rating, also instrument, instructor, single and multi-engine land. 2300 hrs., 1950 as first pilot. Experienced on all pursuit, multi-engine tactical and cargo (mainly C-46 and C-47) types. 32 months with ATC. 3 yrs. college. Age 27. Desire employment on multi-engine equipment. Contact Alex Haddad, Mercedes, Texas.

I HAVE over 125 hours in light planes, will ferry your plane anywhere, anytime for actual expenses only. Also eager to fly co-pilot on heavy planes for actual expenses only. All offers answered. Victor R. Shipp, 625 N. W. 19th St., Oklahoma City 3, Okla.

EX-AAF Bombardier-Navigator has private license, is completing course for commercial license, wants flying job with future, considerable travel involved, no objection to foreign work. Single, 25, sober, eager, will go anywhere, fly anything. Need experience, willing to start at bottom, work up. Have years of experience in newspaper publishing, promotion, advertising, printing, etc. Excellent personal, business, and credit reference. All offers will be thoroughly considered and answered. Victor R. Shipp, 625 N. W. 19th St., Oklahoma City 3, Okla.

EX-ARMY pilot desires flying position. 750 hours—commercial license—single and multi-engine land. Instrument and instructor ratings. Age 22, single. Aubrey A. Sweezey, 50 Clark St., Framingham, Mass.

COMMERCIAL pilot rated for all types aircraft, instrument, instructor, also licensed aircraft and engine mechanic, wants steady, responsible position. Box 477, % FLYING.

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FORMER Air Force Pilot. Commercial single and multi-engine, instructors rating. 3rd class radio permit. Desires fixed based operations combining instruction and charter work. Interested in small field management. Desire location in South. Charles Brookshire, 745 Main St., Cartersville, Ga.

EX-FIGHTER pilot, 1200 hours, one year experience maintenance and flying P-80. Extensive test flying experience and conducting operational suitability tests of fighter aircraft in the AAF Proving Ground Command. Bryan Instrument School graduate. Commercial license, single and multi-engine land. Foreign service not objectionable. Consider all offers. John P. McCann, 523 Basswood St., Jacksonville 6, Fla.

WHAT Are We Offered? Man and wife desire aviation positions—together, if possible, but any offer with a future acceptable. Anywhere North-South America or Europe. Wife, 21, competent secretary experienced United and American Airlines. Man, 29, Graduate VMI Civil Eng., Graduate Boeing School Airline Technician. 2 years aero. eng. Naval Aircraft Factory, 9 months as civilian flight instructor. 8 years rated pilot. Commercial Multi-eng. Land, Single, eng. Land and Sea, Instructor, Instrument. A&E pending. Army Service Pilot, Commanding Officer and Flight-test, Maintenance Officer of Service Squadron in Europe. Experienced with personnel. Suggest Executive Pilot-Hostess of progressive concern with openings, Airport Management, Box 478, % FLYING.

FORMER B-24 pilot, 1100 hours accident free. Single and multi-engine commercial, instrument rating, radio-telephone license. Prefer position as personal or company pilot. All offers considered. Box 479, % FLYING.

FORMER Army Pilot, 4½ years service, desires flying position. 2300 hours in trainers, fighters, light, medium, and heavy bombers. 2½ years basic and advanced instructor. Hold CAA instrument certificate, radio permit and commercial single and multi-engine land pilot rating. Married, dependable. All offers considered and answered. Walter E. Cope, 36 W. Turnbull Ave., Havertown, Pa.

AIR Line Transport pilot 1050-3150 h.p. Both Army transport and commercial airline experience. Over 1600 hours in DC-3's, 322 hours actual inst. time, 1850 hours total time. Married, age 26 years, excellent references. Especially interested in private position combining flying with other duties, but will consider and answer all replies. Box 480, % FLYING.

EX-NAVY pilot with over 4000 accident free hours interested in a job with a future. Holds Commercial license with single and multi-engine, land and sea plus instrument ratings. Family man, age 29. Box 481, % FLYING.

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PILOT Ex-Marine wants flying job. 25 years old, 1300 hrs single multi engine. C.A.A. Instrument. Radio third Class. Go anywhere. R. H. Nelson, 287 Main St., Ridgefield Park, New Jersey.

EX-ARMY Pilot Commercial single and multi. 1100 accident free hrs. Desires position in aviation. Age 24, single, reliable, safe. Will travel. Selling experience. Consider all offers. Write, Paul J. Guysick, 270 Chittenden Ave., Columbus, Ohio.

NEED a pilot who would rather fly than eat? Ex-Army Instructor, 26, married, over 2100 accident free hours in single, twin and multi-engine. Prefer feeder, freight or private company. C.A.A. Commercial, working on Instrument rating. All pilot ratings excellent or better. Box 466, % FLYING.

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EX-ARMY Pilot—1000 accident-free hours. Commercial license with Single, Multi-engined and instrument ratings. 24 years old. Single and will travel anywhere. Have new car. Have flown Cubs to B-17's. Am conscientious and desire to remain active in aviation. All offers considered. Holman D. White, 135 South Lansdowne Ave., Lansdowne, Pa.

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AIRLINE Pilot, formerly Navy, R.A.F., A.A.F., now employed desires change. 35, married, one child, sober. ATR, Commercial, single-multi engine ratings, 2 and 4, instrument, 18 years accident free experience, 8500 hours, 6300 hours certified, 440 hours instrument, 290 actual instrument, 200 hours Link. 1500 hours night, 3500 multi engine up to 71,000 lbs., 2000 hours first pilot scheduled airlines, military and civil, testing experience, Army 5P rating, water experience, trans-Atlantic experience, experienced in all phases truck and air transportation, freight and passenger. Answers solicited only from responsible firms or individuals needing the service of reliable pilot familiar with US, Eto, CBI, Canada and South America. Will go anywhere there is a future. Starting salary secondary. I am looking for permanent position offering security and advancement commensurate with ability. Box 471, % FLYING.

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DEALER	MODEL NO.	TYPE ENGINE	YEAR BUILT	TOTAL HOURS		HOURS SINCE LAST MAJOR OVERHAUL		PRICE
				PLANE	ENGINE	PLANE	ENGINE	
AERONCA								
Northland Flying Service, Northland Airport, Quinesec, Michigan	11AC	Cont. 65	1946	22	22	22	22	$2,450.00
Robinson Aviation, Inc., Teterboro Air Terminal, Teterboro, New Jersey		Cont. 65	1946	135	135	135	135	2,375.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	Chief	Cont. 65	1946	50	50	50	50	2,200.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	Chief	Cont. 65	1939	10	10	10	10	2,200.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	1	Cont. 65	1939	0	0	0	0	2,200.00
Buffalo Air-Park, Inc., 4500 Clinton Street, Gardenville, New York	11AC	Cont. 65	1946	251	251	251	251	2,175.00
Smitty's Flying Service, Box 29, Spencer, Iowa	11AC	Cont. 65	1946	30	30	30	30	2,175.00
Gridley Flying Service, Box 56, Ypsilanti, Michigan	7AC	Cont. 65	1946	340	340	340	340	2,150.00
Lane Air Service, Anniston Municipal Airport, R.F.D. No. 2, Oxford, Alabama	7AC	Cont. 65	1946	190	190	190	190	2,125.00
Smitty's Flying Service, Spencer, Iowa	7AC	Cont. 65	1946	25	25	25	25	2,100.00
A. D. Oliver, Onawa, Iowa	7AC	Cont. 65	1946	92	92	92	92	2,100.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	7AC	Cont. 65	1946	175	175	175	175	2,000.00
Smitty's Flying Service, Box 29, Spencer, Iowa	7AC	Cont. 65	1946	46	46	46	46	2,000.00
Otis Aviation Flying School, Huntingburg Airport, Huntingburg, Indiana	7AC	Cont. 65	1946	300	300	300	300	1,975.00
Tri Angle Airport, Inc., Cross Keys, New Jersey	7AC	Cont. 65	1946	400	400	400	400	1,950.00
Tri Angle Airport, Inc., Cross Keys, New Jersey	7AC	Cont. 65	1946	300	300	300	300	1,950.00
Dethloff Flying Service, Bedford Airport, Bedford, Ohio	7AC	Cont. 65	1946	200	200	200	200	1,950.00
Tri Angle Airport, Inc., Cross Keys, New Jersey	7AC	Cont. 65	1946	350	350	350	350	1,950.00
Smitty's Flying Service, Box 29, Spencer, Iowa	7AC	Cont. 65	1946	205	205	205	205	1,900.00
B & K Flying Service, Fairfield, Illinois	7AC	Cont. 65	1946	400	400	400	400	1,900.00
Robinson Aviation Inc., Teterboro Air Terminal, Teterboro, New Jersey		Cont. 65	1946	425	425	425	425	1,890.00
Metcalf Flying Service, Inc., Box 25, Walbridge, Ohio	7AC	Cont. 65	1946	460	460	460	460	1,800.00
Buffalo Air Park, Inc., 4500 Clinton St., Gardenville, New York	7AC	Cont. 65	1946	450	450	450	450	1,700.00
Prentice Aircraft Sales & Service, Adrian, Michigan	Chief	Lyc. 65	1941	565	565	565	565	1,600.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	50	Cont. 55	1939	1250	1250	50	200	1,500.00
Johnie Cleveland Air Service, 3221 Downing St., Jackson, Mississippi	7AC	Cont. 65	1946	525	525	15	15	1,500.00
E. S. Teiser, R. F. D. No. 4, Henderson, North Carolina	KCA	Cont. 50	1938	1400	1400	1	400	1,500.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	Chief	Lyc. 65	1941	300	300	300	300	1,475.00
Lane Air Service, Anniston Municipal Airport, R. F. D. No. 2, Oxford, Alabama	TCA	Cont. 65	1942	850	850	200	200	1,450.00
H. V. Sterrett, Kinsley, Kansas	TL	Lyc. 65	1940	1952:55	1816:35	163	163	1,300.00
Prentice Aircraft Sales & Service, Adrian, Michigan	TF	Frank. 65	1941	567	567	126	126	1,200.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	TAL	Lyc. 65	1939	2040	1026	10	10	1,200.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	TAF	Frank. 65	1939	1000	1000	5	5	1,200.00
Prentice Aircraft Sales & Service, Adrian, Michigan	TF	Frank. 65	1941	481:30	481:30	81	81	1,200.00
Lane Air Service, Anniston Municipal Airport, R. F. D. No. 2, Oxford, Alabama	TL65	Lyc. 65	1940	850	850	350	350	1,195.00
Metcalf Flying Service, Inc., Box 25, Walbridge, Ohio	L3-B	Cont. 65	1944	1173	548	548	548	1,150.00
Riconn Airport, Route 14, Greene, Rhode Island	TF	Frank. 60	1940	755	755	90	90	1,050.00
Stearman Aviation, Inc., Woodring Field, Enid, Oklahoma	TL	Lyc. 65	1940	1609	532	20	20	1,000.00
Bahnman Aviation Company, Municipal Airport, Commerce, Texas	TL	Lyc. 65	1940	631	826	631	226	795.00
BEECH								
Aircraft Associates, 2611 E. Spring St., Long Beach, California	185	P & W 450	1942	3000	1274		224	55,000.00
Hawthorne Flying Service, Orangeburg, South Carolina	C17R	Wright 430		1643	1643	454	454	13,000.00
Aircraft Associates, 2611 E. Spring St., Long Beach, California	D17S	P & W 450	1945	35	35	35	35	12,000.00
Wm. Steiner, P. O. Box 753, Richmond, Virginia	GB2	P & W 450	1945	75	75	75	75	10,500.00
BELLANCA								
Henson Flying Service, Inc., Municipal Airport, Hagerstown, Maryland	Cruisair	Frank. 150	1946	80	80	80	80	5,300.00
CESSNA								
The Coogan Company, 8440 Sunset Blvd., Hollywood 46, California	T-50	Jacobs 225	1943	1495	0	0	0	14,750.00
Hawthorne Flying Service, Orangeburg, South Carolina	UC-78	Jacobs 245		875	635	875	635	12,000.00
Zimmerly Air Transport, P. O. Box 288, Lewiston, Idaho	C-165	Warner	1939	1480	2358	1480	398:24	8,000.00
Goddard Flying Service, Ardmore Municipal Airport, Ardmore, Oklahoma	T-50	Jacobs 225	1943	1200	230	50	230	7,000.00
Aircraft Service Co., Bradley Field, Boise, Idaho	C-165	Warner 165	1940	1550	276	1550	276	6,500.00
Parks Aircraft, Palwaukee Airport, Wheeling, Illinois	T-50	Jacobs 285	1943	80	80	80	80	6,000.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	T-50	Jacobs 225	1942	1100	210	20	210	5,800.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	T-50	P & W 225	1944	1268	600	1268	0	5,500.00
Smitty's Flying Service, Box 29, Spencer, Iowa	T-50	245	1943	1340	510	1340	510	4,000.00
Delmac Flying Service, Inc., Mason County Airport, Ludington, Michigan	140	Cont. 85	1946	60	60	60	60	3,500.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	140	Cont. 85	1946	150	150	150	150	3,450.00
Metcalf Flying Service, Inc., Box 25, Walbridge, Ohio	140	Cont. 85	1946	296	296	296	296	2,675.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	120	Cont. 85	1946	80	80	80	80	2,300.00
Metcalf Flying Service, Inc., Box 25, Walbridge, Ohio	120	Cont. 85	1946	295	295	295	295	2,175.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	120	Cont. 85	1946	630	630	630	630	1,900.00
CULVER								
Fayetteville Air Service, P. O. Box 708, Fayetteville, North Carolina	LFA	Frank. 90	1941	500	350	200	150	1,975.00
ERCOUPE								
Parks Aircraft, Palwaukee Airport, Wheeling, Illinois	415	Cont. 75	1946	140	140	140	140	3,000.00
Dyersburg Flying Service, Municipal Airport, Dyersburg, Tennessee	415	Cont. 75	1946	10	11	10	11	2,950.00
Sammie Goldin, Box 229, Marshall, Missouri	415	Cont. 75	1946	15	15	15	15	2,850.00
Parks Aircraft, Palwaukee Airport, Wheeling, Illinois	415	Cont. 75	1946	100	100	100	100	2,850.00
Dyersburg Flying Service, Municipal Airport, Dyersburg, Tennessee	415	Cont. 75	1946	60	61	60	61	2,250.00
FAIRCHILD								
Gillis Flying Service, Box 1718, Billings, Montana	24	Warner 165	1946	20	20	20	20	9,000.00
G. E. Verhostra, 1002 E. Jefferson Blvd., South Bend, Indiana	24	Ranger 175	1946	54	54	54	54	7,750.00
Henson Flying Service, Inc., Municipal Airport, Hagerstown, Maryland	24-R-46	Ranger 175	1946	20	20	20	20	7,500.00
The Coogan Company, 8440 Sunset Blvd., Hollywood 46, California	24-R-40	Ranger 175	1940	466	466	66	66	3,875.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	PT-26	Ranger 200	1942	1100	1100	300	300	2,200.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	PT-19	Ranger 175	1943	1100	900	1100	259	1,800.00
Prentice Aircraft Sales & Service, Adrian, Michigan	M62A	Ranger 175	1943	1658	1658	422	422	1,700.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	PT-23	Cont. 220	1943	109:35	109:35	9:20	9:20	1,650.00
Burrill E. Coppernoll, Stockton, Illinois	PT-19	Ranger 175	1943	600	600	600	600	1,500.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	PT-19	Ranger 175	1941	2885:15	1556:50	1023	122:10	1,400.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	PT-23	Cont. 220	1943	58	58	58	58	1,350.00
E. S. Teiser, R. F. D. No. 4, Henderson, N. C.	M62A	Ranger 175	1942	1200	1200		250	1,275.00
R. W. Bleyle, Treaty City Airport, Greenville, Ohio	KR-34	Wright 175	1931	861	861	211	321	1,250.00
Janet C. Hatch Skyways, Inc., Box 652, La Crosse, Wisconsin	M62C	Cont. 220	1942	830	830	40	40	1,150.00

DEALER	MODEL NO.	TYPE ENGINE	YEAR BUILT	TOTAL HOURS		HOURS SINCE LAST MAJOR OVERHAUL		PRICE
				PLANE	ENGINE	PLANE	ENGINE	
GLOBE								
Winged Heart Flying Service, Effingham, Illinois	GC-1B	Cont. 125	1946	82	82	82	82	$5,000.00
Zimmerly Air Transport, P. O. Box 288, Lewiston, Idaho	.....	Cont. 125	1946	36	36	36	36	4,500.00
Monroe Flying Service, Inc., Box 136, Monroe, North Carolina	GC-1B	Cont. 125	1946	70	70	70	70	4,285.00
HOWARD								
The Coogan Co., 8440 Sunset Blvd., Hollywood 46, California	DGA-15P	P & W 450	1943	460	460			8,750.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	GH-2	P & W 450	1943	454	454	454	454	5,000.00
Lane Air Service, Anniston Municipal Airport, R. F. D. No. 2, Oxford, Alabama	DGA-18	Warner 125	1941	700	700	700	700	1,195.00
LUSCOMBE								
Sea Wings, Inc., Westport, Connecticut	8A	Cont. 65	1946	300	300	300		3,200.00
John L. Coppernoll, Stockton, Illinois	.....	Cont. 65	1946	40	40	40	40	2,900.00
Harrisburg-Eldorado Flying Service, R. F. D. No. 4, Harrisburg, Illinois	8A	Cont. 65	1946	50	50	50	50	2,585.00
Gordon Air Service, Municipal Airport, Gordon, Nebraska	8A	Cont. 65	1946	80	80	80	80	2,550.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	8C	Cont. 65	1940	1300	300	1300	300	2,475.00
Valparaiso Aero Club, Inc., Valparaiso, Indiana	8A	Cont. 65	1946	149:20	149:20	149:20	149:20	2,395.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	8H	Cont. 65	1946	230	230	230	230	2,385.00
Valparaiso Aero Club Inc., Valparaiso, Indiana	8A	Cont. 65	1946	149:20	149:20	149:20	149:20	2,295.00
Valparaiso Aero Club Inc., Valparaiso, Indiana	8A	Cont. 65	1946	160	160	160	40	2,000.00
MONOCOUPE								
Fayetteville Air Service, P. O. Box 708, Fayetteville, North Carolina	.....	Lambert 90	1936	565	568	565	25	2,500.00
General Aviation Inc., Fitchburg Airport, Fitchburg, Massachusetts	90A	Radial 90	1936	956	690	956	46	2,000.00
NAVY								
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	N3N-3	Wright 235	1937	2406	2643:45	188:35	188:35	1,200.00
NOORDUYN								
Hawthorne Flying Service, Orangeburg, South Carolina	C-64	P & W 1340	1944	445	445	445	445	14,000.00
Fred Bartholomew Aviation Sales, 2207 Croydon Court, Oklahoma City 6, Okla.	UC-64	P & W 550	1943	506	1897	506	456:56	13,500.00
NORTH AMERICAN								
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	AT-6B	P & W 600	1942	855	164	855	164	2,250.00
PIPER								
Burrill E. Coppernoll, Stockton, Illinois	Super Cruiser	Lyc. 104	.....	35	35	35	35	3,400.00
Stark Flying Service, Coldwater, Kansas	PA-12	Lyc. 100	1946	30:15	30:15	30:15	30:15	3,350.00
Dravosburg Seaplane Base, P. O. Box 133, Dravosburg, Pennsylvania	J3	Cont. 65	1941	483:20	474	0	0	2,950.00
Dravosburg Seaplane Base, P. O. Box 133, Dravosburg, Pennsylvania	J3	Cont. 65	.....	1560:55	1560:55	220:55	220:55	2,750.00
Dravosburg Seaplane Base, P. O. Box 133, Dravosburg, Pennsylvania	J3	Cont. 65	1941	1595	1032:50	526	.....	2,650.00
Prentice Aircraft Sales & Service, Adrian, Michigan	J3-C	Cont. 65	1946	8	8	8	8	2,295.00
Johnie Cleveland Air Service, 3221 Downing St., Jackson, Mississippi	.....	Cont. 75	1941	1200	0	40	0	2,250.00
Dr. C. R. May, Jr., Bennettsville, S. C.	J3-C	65HP	1945	10	10	10	10	2,200.00
Edison G. Ward, Martin, South Dakota	J5-B	Lyc. 75	1941	970	970	65	65	2,000.00
Fayetteville Air Service, P. O. Box 708, Fayetteville, North Carolina	J5	Cont. 75	1941	1960	1960	300	140	2,000.00
Plainfield Airways Inc., Plainfield, Connecticut	J5-A	Cont. 75	1941	390	420	11:05	11:05	2,000.00
Davis Bros. Flying Service, Daleville Airport, R. D. No. 3, Moscow, Pennsylvania	J	Cont. 65	1945	175:50	175:50	175:50	175:50	1,985.00
Smitty's Flying Service, Box 29, Spencer, Iowa	J5	Cont. 65	1941	925	425	150	150	1,975.00
Fayetteville Air Service, P. O. Box 708, Fayetteville, North Carolina	J3	Cont. 65	1946	340	340	340	340	1,950.00
Boyd Aero Service, Santa Fe Old Municipal Airport, Santo Fe, New Mexico	J3	Cont. 65	1946	250	250	250	250	1,950.00
Evergreen Airport, R. F. D. 2, Warren, Illinois	J3	Cont. 65	1945	75	75	75	75	1,950.00
Zimmerly Air Transport, P. O. Box 288, Lewiston, Idaho	J3	Cont. 65	1941	4609	3191	4609	288	1,900.00
Prentice Aircraft Sales & Service, Adrian, Michigan	J3-C	Cont. 65	1946	420	420	420	420	1,895.00
E. S. Teiser, R. F. D. No. 4, Henderson, North Carolina	J3-C	Cont. 65	1946	325	325	325	325	1,850.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	J3	Cont. 65	1946	530	273	530	273	1,850.00
Prentice Aircraft Sales & Service, Adrian, Michigan	J3-C	Cont. 65	1946	315	315	315	315	1,800.00
John L. Coppernoll, Stockton, Illinois	J3	Cont. 65	1946	80	80	80	80	1,750.00
Prentice Aircraft Sales & Service, Adrian, Michigan	J3-C	Cont. 65	1946	571	571	571	571	1,724.00
Boyd Aero Service, Santa Fe Old Municipal Airport, Santa Fe, New Mexico	J3	Cont. 65	1946	600	600	600	600	1,700.00
Maheu's Airport, Inc., R. F. D. No. 2, Mechanic Falls, Maine	J3	Lyc. 65	1941	3225	2925:45	148	98	1,695.00
Dr. A. N. Abbott, Box 25, Shawano, Wisconsin	J4-E	Cont. 75	1941	525	525	525	25	1,695.00
Prentice Aircraft Sales & Service, Adrian, Michigan	J3	Cont. 65	1946	575	575	575	250	1,675.00
Boyd Aero Service, Santa Fe Old Municipal Airport, Santa Fe, New Mexico	J3	Cont. 65	1946	600	600	100	100	1,650.00
Niederhauser Airways, Marshalltown, Iowa	J5-A	Cont. 75	1940	2002	1689	2002	1689	1,650.00
H & H Airways, Boire Field, Nashua, New Hampshire	J3	Frank. 60	1939	2731	2968	4	9	1,600.00
Fred Bartholomew Aviation Sales, 2207 Croyden Court, Oklahoma City 6, Okla.	J3-C	Cont. 65	1940	3166	2370	300	0	1,550.00
Fred Bartholomew Aviation Sales, 2207 Croyden Court, Oklahoma City 6, Okla.	J3-C	Cont. 65	1940	3945	1948	475	0	1,550.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	J3	Frank. 65	1941	1083	981	200	200	1,550.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	J4	Cont. 65	1939	475	475	475	45	1,500.00
Henson Flying Service, Inc., Municipal Airport, Hagerstown, Maryland	J5-A	Cont. 75	1941	2018	600	42	42	1,500.00
Dethloff Flying Service, Bedford Airport, Bedford, Ohio	J3	Cont. 65	1943	900	900	200	200	1,500.00
Sammie Goldin, Box 229, Marshall, Missouri	J3-C	Cont. 65	1946	925	925	25	25	1,495.00
Maheu's Airport, Inc., R. F. D. No. 2, Mechanic Falls, Maine	J3	Lyc. 65	1941	3479:30	1914:10	3479:30	720:10	1,495.00
Maheu's Airport, Inc., R. F. D. No. 2, Mechanic Falls, Maine	J3	Lyc. 65	1941	3149:30	1772:45	587:55	596:15	1,495.00
Lane Air Service, Anniston Municipal Airport, R. F. D. No. 2, Oxford, Alabama	J3-C	Cont. 65	1940	1075	850	50	150	1,450.00
Fred Bartholomew Aviation Sales, 2207 Croyden Court, Oklahoma City 6, Okla.	J3-C	Cont. 65	1940	4050	2931	400	312	1,450.00
Fred Bartholomew Aviation Sales, 2207 Croyden Court, Oklahoma City 6, Okla.	J3-C	Cont. 65	1941	3915	1855	750	425	1,450.00
Lorraine R. Lasswell, Highland-Winet Airport, Highland, Illinois	J3	Lyc. 65	1941	3000	430	430	430	1,300.00
J. B. Carson, Newark Airport, Newark, Ohio	J3	Lyc. 65	1941	1800	1800	1800	175	1,250.00
J. B. Carson, Newark Airport, Newark, Ohio	J3	Lyc. 65	1941	2000	2000	2000	175	1,250.00
R. W. Stout, Cherokee, Oklahoma	J3	Cont. 50	1939	2200	1700	25	160	1,200.00
Stearman Aviation Inc., Woodring Field, Enid, Oklahoma	J3-L	Lyc. 65	1941	3011	1079	15	15	1,200.00
Henson Flying Service, Inc., Municipal Airport, Hagerstown, Maryland	J3	Cont. 65	1941	2535	1000	42	42	1,150.00
Stark Flying Service, Coldwater, Kansas	J3-L	Lyc. 50	1939	80	15	80	15	1,150.00
Riconn Airport, Route 14, Greene, Rhode Island	J3	Frank. 50	1938	836	1021	25	25	1,100.00
Valparaiso Aero Club Inc., Valparaiso, Indiana	J3	Frank. 65	1941	1250	30	1250	30	1,050.00
Niederhauser Airways, Marshalltown, Iowa	J3	Lyc. 65	1941	1996	2326	1996	785	995.00
Niederhauser Airways, Marshalltown, Iowa	J3-L	Lyc. 65	1941	3364	3364	3364	325:30	995.00
Valparaiso Aero Club Inc., Valparaiso, Indiana	J3	Frank. 65	1941	1650	135	1650	135	950.00
PORTERFIELD								
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	FP-65	Frank. 65	1941	1033	1810:45	60	60	1,650.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	LP-65	Lyc. 65	1940	1732	1732	0	0	1,475.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	LP-65	Lyc. 65	1941	1611	1413	137:40	319:30	1,400.00
REARWIN								
The Coogan Company, 8440 Sunset Boulevard, Hollywood 46, California	8135T	Ken Royce 120	1942	1800	540	0	22	1,950.00
R. W. Bleyle, Treaty City Airport, Greenville, Ohio	9000	Le Blond 90	1938	620	620	620	120	1,550.00

DEALER	MODEL NO.	TYPE ENGINE	YEAR BUILT	TOTAL HOURS		HOURS SINCE LAST MAJOR OVERHAUL		PRICE
				PLANE	ENGINE	PLANE	ENGINE	
RYAN								
Maheu's Airport, Inc., R. F. D. No. 2, Mechanic Falls, Maine	ST-A	Menasco 125	1937	2159	1784	52:25	337:45	2,195.00
Flathead Air Transport, Inc., New Flathead County Airport, Kalispell, Montana	ST3-KR	Kinner 160	1942	450	450	450	450	1,700.00
R. W. Bleyle, Treaty City Airport, Greenville, Ohio	PT-22	Kinner 165	1943	431	431	431	85	1,600.00
Pierce Aviation Company, Municipal Air Port, Fort Wayne, Indiana	PT-22	Kinner 165	1943	230	230	230	230	1,400.00
SCHWEIZER								
G. E. Verhostra, 1002 East Jefferson Boulevard, South Bend, Indiana	1-19	Glider	1948	11	0	11	0	1,000.00
SKYRANGER								
Sammie Goldin, Box 229, Marshall, Missouri	185	Cont. 85	1946	1:30	1:30	1:30	1:30	2,795.00
STEARMAN								
Akron Airways, Inc., Municipal Airport, Akron, Ohio	PT-17	Cont. 220	1943	248	248	248	248	1,750.00
The Coogan Company, 8440 Sunset Boulevard, Hollywood 46, California	PT-17	Cont. 220	1942	1200	900	450	168	1,450.00
The Coogan Company, 8440 Sunset Boulevard, Hollywood 46, California	PT-17	Cont. 220	1942	1200	900	450	168	950.00
STINSON								
E. S. Teiser, R. F. D. No. 4, Henderson, North Carolina	V-77	Lyc. 295	1944	72	849	72	849	8,500.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	SR-9C	Lyc. 280	1937	3140:45	73:25	242:50	73:25	7,600.00
Parks Aircraft, Palwaukee Airport, Wheeling, Illinois	150	Frank. 150	1946	101	101	101	101	6,000.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	150	Frank. 150	1947	30	30	30	30	6,000.00
Pierce Aviation Company, Municipal Airport, Fort Wayne, Indiana	150	Frank. 150	1946	100	100	100	100	5,800.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	150	Frank. 150	1946	23	23	23	23	5,500.00
Otis Aviation Flying School, Huntingburg Airport, Huntingburg, Indiana	150	Frank. 150	1946	75	75	75	75	5,495.00
Evergreen Airport, R. F. D. No. 2, Warren, Illinois	150	Frank. 150	1946	350	350	350	350	5,450.00
Alexandria Aviation Inc., Municipal Airport, Alexandria, Minnesota	108	Frank. 150	1946	150	150	150	150	4,850.00
B. & K. Flying Service, Fairfield, Illinois	10A	Frank. 90	1941	530	160	530	160	3,000.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	L5	Lyc. 190	1942	1245	392	0	0	2,975.00
Fred Bartholomew Aviation Sales, 2207 Croydon	105	Cont. 80	1939	1515	150:20	75	150	2,250.00
Gillis Flying Service, Box 1718, Billings, Montana	SM8-A	Lyc. 215	1932	1300	400	20	20	1,800.00
TAYLORCRAFT								
Aircraft Associates, 2611 East Spring Street, Long Beach, California	De Luxe	Cont. 65	1946	40	40	40	40	2,550.00
South Branch Air Service, Inc., Moorefield, West Virginia	BC12-D	Cont. 65	1946	25	25	25	25	2,400.00
Flathead Air Transport, Inc., New Flathead County Air Port, Kalispell, Montana	BC12-D	Cont. 65	1946	254	254	254	254	2,300.00
Zimmerly Air Transport, P. O. Box 288, Lewiston, Idaho	BC12-D	Cont. 65	1946	75	75	75	75	2,300.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	BL65	Lyc. 65	1941	2000	2000	50	50	2,200.00
Flathead Air Transport, Inc., New Flathead County Air Port, Kalispell, Montana	BC12-D	Cont. 65	1946	225	225	225	225	2,100.00
South Branch Air Service, Inc., Moorefield, West Virginia	BC12-D	Cont. 65	1946	110	110	110	110	2,095.00
Evergreen Airport, R. F. D. 2, Warren, Illinois	BC12-D	Cont. 65	1946	250	250	250	250	2,050.00
Boyd Aero Service, Santa Fe Old Municipal Airport, Santa Fe, New Mexico	BC12-D	Cont. 65	1946	150	150	50	50	2,000.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	BC12	Cont. 65	1941	40	40	40	40	2,000.00
R. F. Raymond, Main Street Garage, Phillips, Maine	DCO	65HP	1943	465	465	465	465	1,995.00
Bahnman Aviation Company, Municipal Airport, Commerce, Texas	BC12-D	Cont. 65	1946	247	247	247	247	1,995.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	BC65	Cont. 65	1940	1500	1500	0	0	1,975.00
Otis Aviation Flying School, Huntingburg Airport, Huntingburg, Indiana	BC12-D	Cont. 65	1946	300	300	300	300	1,950.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	....	Cont. 65	1945	40	40	40	40	1,900.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	BF65	Frank. 65	1941	2000	2000	300	300	1,900.00
Sammie Goldin, Box 229, Marshall, Missouri	BC12-D	Cont. 65	1946	27	27	27	27	1,895.00
Sammie Goldin, Box 229, Marshall, Missouri	BC12-D	Cont. 65	1946	135	135	135	135	1,895.00
Maheu's Airport, Inc., R. F. D. No. 2, Mechanic Falls, Maine	BL65	Lyc. 65	1940	759:25	758:25	198:45	208:15	1,795.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BL65	Lyc. 65	1940	1480	1300	1480	731:15	1,750.00
Alfred R. Sitko, Sandpoint, Idaho	L2B	Cont. 65	1941	688	688	688	88	1,750.00
McAlester Air Service, Municipal Airport, McAlester, Oklahoma	BC12	65HP	1941	1250	125	30	125	1,700.00
H & H Airways, Boire Field, Nashua, New Hampshire	BLT	Lyc. 65	1940	1392	1408	278	283	1,700.00
B & K Flying Service, Fairfield, Illinois	L2M	Cont. 65	1944	600	600	1	1	1,650.00
Charles Harris Jr., Box 365, Versailles, Missouri	DCO	Cont. 65	1944	250	250	250	250	1,650.00
McAlester Air Service, Municipal Airport, McAlester, Oklahoma	BC	Cont. 65	1940	1050	1050	135	135	1,600.00
McAlester Air Service, Municipal Airport, McAlester, Oklahoma	BC	Cont. 65	1940	925	140	140	140	1,600.00
McAlester Air Service, Municipal Airport, McAlester, Oklahoma	BC	Cont. 65	1940	850	125	850	125	1,600.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	DCO	Cont. 65	1942	500	0	0	0	1,600.00
Charles Harris Jr., Box 365, Versailles, Missouri	40	Cont. 65	1942	400	120	400	120	1,600.00
R. W. Bleyle, Treaty City Airport, Greenville, Ohio	BL65	Lyc. 65	1941	800	410	120	120	1,550.00
Lorraine R. Lasswell, Highland-Winet Airport, Highland, Illinois	BL	Lyc. 65	1941	2700	1550	2700	400	1,500.00
Gridley Flying Service, Box 56, Ypsilanti, Michigan	B12	Frank. 65	1941	1563	1563	620	620	1,500.00
Bishop Flying Service, Bishop Airport, Flint, Michigan	BC12	De Luxe 65	1941	1463	1365	708	459	1,500.00
J. B. Carson, Newark Airport, Newark, Ohio	B12	Lyc. 65	1940	2475	950	2475	950	1,450.00
B & K Flying Service, Fairfield, Illinois	BL65	Lyc. 65	1940	585	585	585	140	1,450.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BF12	Frank. 65	1942	2724:15	1682:15	2724: 15	709:30	1,400.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BL65	Lyc. 65	1940	2613:30	2702:35	1575	294:05	1,400.00
Three Rivers Flying Service, Haines Airport, Three Rivers, Michigan	2PCLM	Cont. 65	1943	754	768	58	339	1,345.00
R. W. Bleyle, Treaty City Airport, Greenville, Ohio	BL	Lyc. 65	1940	800	800	200	120	1,250.00
Bishop Flying Service, Bishop Airport, Flint, Michigan	BF12	DeLuxe 65	1941	3490	3457	667	42	1,250.00
Walley Aviation, Airport, Las Animas, Colorado	BL	Lyc. 65	1941	3056	3249	75	400	1,200.00
Bishop Flying Service, Bishop Airport, Flint, Michigan	BC65	65	1941	2594	2577	987	147	1,150.00
Otis Aviation Flying School, Huntingburg Airport, Huntingburg, Indiana	DCO-65	Cont. 65	1943	1000	1000	100	400	1,000.00
Evergreen Airport, R. F. D. 2, Warren, Illinois	DCO-65	Cont. 65	1943	675	675	675	55	950.00
TIMM								
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	N2T	Cont. 220	1943	793	650	793	150	1,650.00
VULTEE								
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	BT-13A	P&W 450	1942	2100	1100	130	130	2,250.00
J. G. Davis, Box 4082, Knoxville, Tennessee	BT-13A	P&W 450	1941	3760	1264	0	0	2,150.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	BT-13	P&W 450	1942	200	1478	200	136	1,975.00
Harrisburg-Eldorado Flying Service, R. F. D. 4, Harrisburg, Illinois	R-985 AN-3	P&W 450	1943	1367	2022	75	310	1,750.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BT-13	Wasp 460	1942	2781:30	477:20	2781:30	477:20	1,650.00
Fred Bartholomew Aviation Sales, 2207 Croydon Court, Oklahoma City 6, Oklahoma	SNV-2	P&W	1944	767	767	767	168	1,650.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	BT-13	P&W 450	1942	225	1478	225	150	1,475.00
Plainfield Airway Inc., Plainfield, Connecticut	BT-13A	P&W 450	1944	1535	585	13:05	13:05	1,200.00
Sparta Flying Service, 511 West Main Street, Sparta, Wisconsin	BT-13B	P&W 450	1944	1250	890	190	190	1,050.00
Goddard Flying Service, Ardmore Municipal Airport, Ardmore, Oklahoma	BT15	Wright 440	1943	1200	210	40	210	1,000.00
Goddard Flying Service, Ardmore Municipal Airport, Ardmore, Oklahoma	BT15	Wright 440	1943	1110	250	0	250	1,000.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	BT-15	Wright 450	1944	1005	250	10	250	895.00
WACO								
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	ZGC	Jacobs 285	1937	1200	1300	1200	25	8,000.00
Hawthorne Flying Service, Orangeburg, South Carolina	ZQC-6	Jacobs	....	1011	1076	116	352	4,000.00
Aircraft Service Co., Bradley Field, Boise, Idaho	ZQC	Jacobs 285	1936	816	816	63:15	63:15	3,900.00
Gillis Flying Service, Box 1718, Billings, Montana	UIC	Cont. 210	1937	1200	870	75	75	3,495.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	UPF-7	Cont. 220	1941	3000	2168	3000	2168	1,250.00
Spartan School of Aeronautics, Municipal Airport, Tulsa, Oklahoma	UPF-7	Cont. 220	1941	3000	2168	0	0	1,250.00

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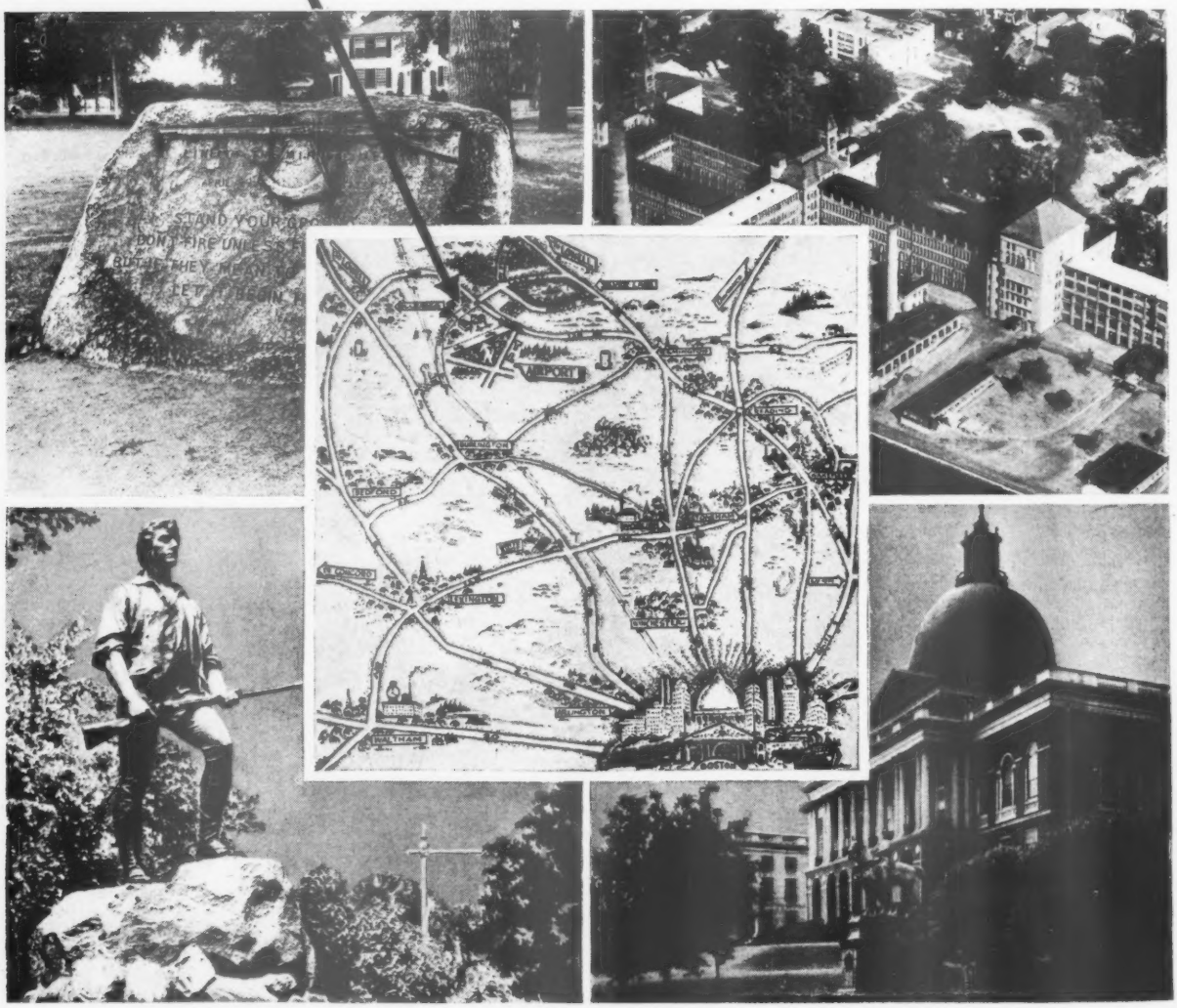

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